Proceedings of the IX Workshop of the All India Coordinated Research Project on Spices

HELD AT
Dr. Y. S. Parmar University of Horticulture & Forestry
NAUNI, SOLAN, HIMACHAL PRADESH
DURING
SEPTEMBER 21-23, 1988

Project Coordinator: S. EDISON

ALL INDIA COORDINATED RESEARCH PROJECT ON SPICES
NATIONAL RESEARCH CENTRE FOR SPICES
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
CALICUT 673 012, KERALA

1988

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C O N T E N T S

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ACKNOWLEDGEMENTS

I express my gratitude to Shri Sant Ram Ji, Hon'ble Minister for Agriculture, Govt. of Himachal Pradesh for having kindly inaugurated the IX Spices Workshop at Solan, the first time when it has been held in the Northern most part of this country. We are indeed grateful to him for the thought-provoking inaugural address highlighting the importance of [illegible] spices in general and the needs on research & development for Himachal Pradesh in particular. We thank Dr. M.R. Thakur, Vice Chancellor, Dr. Y.S. Parmar University of Horticulture & Forestry for having hosted the Workshop and made available all facilities for the successful conduct of the same. I'm gratefully indebted to Dr. NS Randhawa, DG, ICAR & Dr. KL Chadha DDG (Hort) for having guided us at various levels for the successful planning and conduct of the Workshop at Solan.

We are particularly glad that the ICAR could depute many senior officers to participate in the Workshop. Dr.Ramphal, ADG (Hort) and Dr. S. Nagarajan, ADG (PP) have made an important impact in the deliberations and helped us to finalise the various programmes. It was also quite encouraging that the ICAR could depute Dr. DN Srivastava, DDG (CS) (Retd.) for his active participation and guidance especially with reference to the programmes on plant protection. Sri T.A. Sriram, Sr.Tech. Officer, ICAR has been all along with us to help the proceedings of the Workshop.

From the host University, Dr. T.R. Chadha, Director of Research and Dr. G.S. Dogra, Dean, College of Horticulture have spared lot of their valuable time in providing necessary instructions and supervising the arrangements made for the Workshop in a remote place like Nauni, Solan. Our special appreciations are due to Dr. P.P. Sharma, Professor & Head, Department of Vegetable Crops, Dr. R.S. Rattan, Assoc. Professor i/c of the Spices Scheme at the Solan centre and innumerable colleagues in the Department as well as the University for taking care of the delegates and organising the Workshop. I'm also grateful to Dr. Charanjit Singh, Director of Agriculture who has taken pains to participate in the Workshop and also offer his valuable suggestions with special reference to ginger development.

The Directorate of Cocoa, Arecanut & Spices Development was represented by Shri E. Velappan, Director. This had an important interaction in our programmes on research and development. The NABARD was represented quite heavily with the participation of Dr. V.S. Motial, General Manager (Tech.Services) and two of his senior colleagues who have taken pains to participate in the deliberations. It was also useful that Dr. H.S. Sohi, Director, NRC for Mushroom Research & Training, an ICAR institution who gave us all support and help in the conduct of the Workshop; he also participated in the various discussions during the technical sessions. The Spices Board, Cochin was kind enough to depute Dr. R. Naidu, Director, ICRI, Myladumpara and his team to participate and take advantage of the Workshop.

I also thank the various Agricultural Universities for having nominated senior officers like Assoc. Directors, Prof. & Head of the Research Stations and the Scientists from the Coordinating centres by enabling their participation in the Workshop at Solan.

I take this opportunity to thank the All India Radio, Shimla and the correspondents of the various news papers for having covered the inaugural function. We also thank the various input agencies viz. pesticide firms, fertiliser manufacturers/dealers etc. who have cooperated in the conduct of the Workshop.

Last but not the least, I'm personally grateful to Dr. M.K. Nair, Director, CPCRI and Dr. A. Ramadasan, Joint Director, NRCS for their active cooperation, support and for providing all facilities required for the conduct of the Workshop. I'm also grateful to them for having nominated several senior Scientists from the NRCS who took active part in the deliberations.

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12 Dec 98

(S. Edison)
Project Coordinator

PROGRAMME

SEPTEMBER 21, 1988

0830 - 1100	:	Registration
1100 - 1300	:	Inaugural Session
		Prayer
1100 - 1110	:	Welcome Address
		Dr. T.R. Chadha Director of Research Dr. YS Parmar Univ. of Hort. & Forestry, Solan 173 230
1110 - 1140	:	Project Coordinator's report
		Dr. S. Edison National Research Centre for Spices Calicut 673 012
1140 - 1150	:	Remarks by
		Dr. Ramphal Asst.Director General (Hort) ICAR, New Delhi 110 001
1150 - 1230	:	Inaugural address
		Shri Sant Ram Ji Hon'ble Minister for Agriculture Himachal Pradesh
1230 - 1240	:	Vote of thanks
		Dr. G.S. Dogra Dean, College of Horticulture Dr. YS Parmar Univ. of Hort & Forestry, Solan 173 230
1240 - 1250	:	Tea break

TECHNICAL SESSION I

1300 - 1400 : Action taken on the recommendation of the previous Workshop.

Chairman : Dr. Ramphal

Rapporteurs : i) Dr. S. Edison

ii) Shri T.A. Sriram

1400 - 1430 : Lunch break

TECHNICAL SESSION II

1600 - 1900 : Genetics & Plant Breeding

Chairman : Dr. M. Rama Rao

Rapporteurs : i) Dr. H.M. Chandrappa

ii) Shri Peter G.B. Vedamuthu

TECHNICAL SESSION III

1900 - 2030 : Germplasm

Chairman : Dr. M. Rama Rao

Rapporteurs : i) Dr. H.M. Chandrappa

ii) Shri Peter G.B. Vedamuthu

SEPTEMBER 22, 1988

TECHNICAL SESSION IV

0900 - 1215 : Agronomy & Soil Science

Chairman : Dr. K.G. Shanmugavelu

Rapporteurs : Dr. A.K. Sadanandan

Shri D.S. Bhatti

TECHNICAL SESSION V

1230 - 1700 : Plant Pathology

Chairman : Dr. D.N. Srivastava

Rapporteurs : i) Dr. A.N. Venugopal

ii) Dr. V. Prakasam

1330 - 1430 : Lunch break

TECHNICAL SESSION VI

1700 - 1900 : Entomology, Physiology & [illegible] Biochemistry

Chairman : Dr. G.S. Dogra

Rapporteur : Dr. T. Prem Kumar

TECHNICAL SESSION VII
(concurrent session)

1630 - 1900 : Group meeting on variety release

Chairman : Dr. K.G. Shanmugavelu

SEPTEMBER 23, 1988

1000 - 1600 : Meeting of the Working Group II on Spices Research

PLENARY SESSION

1600 - 1900 : Plenary session

Chairman : Dr. K.L. Chadha

Rapporteur : Dr. S. Edison

SEPTEMBER 24, 1988

0930 - 1400 : Meeting of the Working Group II on Spices Research (contd.)

PRESENTATION OF THE RECOMMENDATIONS OF THE TECHNICAL SESSIONS

TECHNICAL SESSION		PRESENTED BY
1.	Genetics & Plant Breeding	: Dr. M. Rama Rao
2.	Germplasm	: Dr. M. Rama Rao
3.	Agronomy & Soil Science	: Dr. K.G. Shanmugavelu
4.	Plant Pathology	: Dr. D.N. Srivastava
5.	Entomology	: Dr. G.S. Dogra
6.	Biochemistry & Physiology	: Dr. A. Ramadasan
7.	Special session on Variety Release	: Dr. K.G. Shanmugavelu

INAUGURAL SESSION

The IX Workshop of the All India Coordinated Research Project on spices was held during September 21-23, 1988 at the Dr. Y.S. Parmar University of Horticulture & Forestry at Nauni, Solan (Himachal Pradesh). The All India Coordinated Research Project on Spices started functioning independently with Headquarters at the National Research Centre for Spices, Calicut since April 1986 with the bifurcation of the erstwhile All India Coordinated Spices and Cashew Improvement Project. The present Workshop, the second independent Workshop held exclusively for spices was attended by one hundred and twenty delegates from 14 out of the 15 coordinating centres of the Project in various State Agricultural Universities situated in 9 States besides ICAR officials including the scientists of NRCS, Directorate of Cocoa, Arecanut & Spices, Spices Board, NABARD and other user and input agencies.

The Workshop was inaugurated by Shri Sant Ram Ji, Hon'ble Minister for Agriculture, Govt. of Himachal Pradesh on the forenoon of 21st September. Dr. T.R. Chadha, Director of Research of the host University welcomed the chief guest and the delegates to the Workshop. Dr. Ramphal, Asst. Director General (Hort) made the introductory remarks. Dr. S. Edison, Project Coordinator presented a brief report of progress in research and the achievements made under the All India Coordinated Research Project on Spices for the year 1986-87.

The Hon'ble Minister in his inaugural address emphasised the importance of the role of spices in our food habits. The Minister in his address laid emphasis on the need for intensifying research and development work on the various important spices. He also appealed to the scientists to focus attention to increase productivity and improve the quality of spices. In respect to Himachal Pradesh, he stressed the need to develop high yielding ginger varieties with less fibre and high essential oil content coupled with resistance to rhizome rot disease. He mentioned that the other spice crops grown in commercial scale in Himachal Pradesh are turmeric, coriander, chillies in addition to kala zira that grows wildely and small cardamom cultivated in small scale in kitchen gardens. He also pleaded for improving the marketting facilities of spices since there is a big gap in the prices what farmers get and what consumer pays, he demanded stability of price.

The status of progress in the various experiments were reviewed in detail under the 6 technical sessions with reference to the objectives of the coordinated project and the decisions taken were presented in the Proceedings. The salient points which emerged from the Workshop were discussed in the plenary session on the 23rd September under the Chairmanship of Dr. K.L. Chadha, Deputy Director General (Hort), ICAR, as listed below :

i) Out of the six proposals received for variety release only one variety in fenugreek viz. NL (M) has been recommended for release. The variety is capable of yielding up to 6 q/ha and has moderate resistance to root rot and powdery mildew diseases in Rajasthan.

ii) Promising lines under advance stages of assessments are : Cultures 239, 141, 331 in pepper, Cultures PCT-13, PCT-14, 15B, 21A in turmeric, Cultures CS 287, CS 2, CS 4, CS 6, CS 694 and UD-374 in coriander, Cultures UC 198 in Cumin and Methi-3 in fenugreek.

iii) The Workshop suggested a cautious approach while experimenting with organo mercurial fungicides besides newer chemicals like Metalaxyl, Al-Fosetyl in view of the break down of resistance and other ecological aspects.

INAUGURAL SESSION

PROJECT COORDINATOR'S BRIEF REPORT

India's foreign exchange earnings by export of spices has been steadily increasing and during 1987-88 this has touched a figure of Rs. 300 crores, bulk of which has been through export of pepper alone. Besides pepper, cardamom and turmeric are the other two foreign exchange earning spices. The research and development on spices has not been very encouraging until the ICAR commenced concerted research activities through the All India Coordinated Spices Improvement Project.

The All India Coordinated Spices Improvement Project envisaged research on cardamom, pepper, ginger, turmeric, cumin, coriander, fennel, fenugreek and large cardamom. The research programmes are carried out in 15 centres spread over in the various Agricultural Universities in the country as enlisted elsewhere (Appendix I). The Headquarters of the Project is located at the National Research Centre for Spices, Calicut. The research centres under the Project are located in different agro-climatic regions in 9 states. The major objectives of the project are :

i) Evolving high yielding varieties resistant/tolerant to diseases and pests,

ii) Standardisation of agro-techniques for the crops under different agro-climatic conditions,

iii) Evolving control measures for major pests and diseases and

iv) Working as an inter-face and feed-back between the Agricultural Universities and the CPCRI/ NRCS and ICAR.

The first Workshop of the combined All India Coordinated Spices and Cashewnut Improvement Project was held at Kasaragod in 1971 and formulated research programmes on pepper, cardamom, ginger and turmeric and in the beginning, 5 centres were functioning on spices. The research on condiments was initiated after the 3rd Workshop held at Coimbatore and the subsequent workshops held at Goa (1978), Trichur (1981), Calicut (1983), Trivandrum (1985) and Guntur (1987) reviewed the progress of implementation of the technical programmes at various centres. Since 1986-87 independent spices Workshops have been commenced and accordingly the VIII Workshop was held at Guntur in Andhra Pradesh during January-February 1987; this was also the first independent Workshop for Spices. The technical programmes were modified wherever necessary in the light of detailed discussions during the Workshop and followed by separate discussions on annual crops. The performance of the various research programmes under these coordinated projects was reviewed at the last Workshop held at Solan and the Workshop has recommended for the release of one variety in fenugreek.

The VI Plan enabled starting of two new centres on pepper, one on cardamom and one on ginger and turmeric. During the VII Plan, an additional centre each for turmeric in Andhra Pradesh and for large cardamom in Gangtok have been sanctioned. The project has an allocation of Rs.104.86 lakhs during the VII Plan.

There are 51 experiments which included nine on cardamom, five on pepper, four on ginger, two on turmeric, three on large cardamom and 28 on condiments. A brief report on the salient research highlights obtained during 1986-87 are presented below:

1. Pepper : The cultivar Kuthiravaly has been found to be stable in yield after studying the stability parameters for over 6 years; this yields 2.32 kg dry pepper per vine. Out of 7000 cultivars evaluated so far, about 11 promising cultivars have been taken into multilocation and comparative yield trials. Two more advanced cultures 239 & 331 could yield higher and are under pre-release testing. Fertiliser application has been revised as 50:50:200 g NPK/vine/year.

The fungal pollu disease can be controlled by 2 rounds of spraying with 1% Bordeaux mixture. The nursery diseases can be controlled by fortnightly spraying and drenching with 1% Bordeaux mixture or 1% Difolaton. The quick wilt disease is controlled by spraying with 1% Bordeaux mixture and applying 10%

Bordeaux paste in the collar region. Experiments with newer fungicides like Ridomil, Aliette etc. are under progress.

2. Cardamom : There has been increase in the activity of germplasm collection in cardamom; the Mudigere, Pampadumpara and Yercaud centres have 213, 70 and 23 accessions respectively. High yielding clones viz. CL-679, CL-683 and CL-726 have gone into on-farm trials in Mudigere centre. The highest yield was recorded in the diallel cross between multiple branching x extra bold, which yielded 906 gm/clump. High density planting with 1.8 x 0.9 m and 1.8 x 0.6 m was found beneficial. Advanced cultures PV 1 and P1 have been recommended for release as varieties in Kerala and Karnataka respectively.

The Azhukal disease in Kerala has been authentically identified to be caused by Phytophthora meadii and can be controlled by spraying 1% Bordeaux mixture and soil drench, done twice or thrice. Experiments with newer chemicals like Aliette and Ridomil are in progress. A combination spray of Nuvacron 40% EC and Ekalux 25% EC at monthly intervals has controlled the thrips in cardamom in Karnataka.

3. Large cardamom : The new coordinating centre for large cardamom has been established at Gangtok under the ICAR Research Complex for NEH region this year. A comparative yield trial with 13 popular cultivars has been laid out. Collaborative programmes on viral diseases of this crop have been planned

with the IARI. Studies have been initiated for control of clump rot, leaf spot etc.

4. Ginger : At Pottangi, the highest number of germplasm collections viz. 120 has been maintained; the germplasm in other centres are less and are affected by rhizome rot. Sel.PGS-35 with 16.6 T/ha green rhizomes, 1.9% essential oil and 4.4% crude fibre has been proposed for release from Pottangi. Sel.SG-666 from Solan centre has a fair amount of resistance to the rhizome rot and this material has been sent for testing in Kerala where the problem is serious. Seed rhizome size has been standardised at 20 g. Intercropping with french bean was profitable in Orissa. Seed treatment with Captafol (0.2% a.i) decreased the post-emergence rot of ginger; soil drenching with Dithane M45 (0.3%) also decreased the rot. At Solan, dipping of seed rhizomes in Blitox-50 @ 0.3% could control rhizome rot in storage and the recovered seed material.

5. Turmeric : The Pottangi centre holds the highest number of germplasm viz. 150; the Vellanikkara and Solan centres have only 59 and 39 entries respectively The selection PTS-10 from Pottangi gave an average yield of 20.7 T/ha of green rhizomes, 9.3% curcumin and 4.2% essential oil and the same has been proposed for release This selection also had a higher percentage of dryage.

Farm yard manure and green leaf mulch @ 7 kg and 2.5 kg/m^2 bed respectively, together with a fertiliser dose of 60 kg N, 30 kg P and 90 kg K/ha gave the highest yield of 34 T/ha. At Solan, selections ST-3 and ST-323 gave minimum incidence of Taphrina leaf spot disease. Rhizome scales have been controlled by Dimocron (0.05%) spray in field and seed dressing with Quinalphos (0.025%). Turmeric selections 15B and 21A were found promising in Vellanikkara centre.

A new centre for turmeric has been established at Jagtial under APAU. A multilocation trial has been laid out during the first year.

6. Cumin : The comparative yield trial gave the highest yielding cultivar UC-19, a selection from Rajasthan. This has been proposed for release as a variety and yields 5-9 Q/ha, 2.6% volatile oil and is tolerant to cumin wilt. Another selection EC 109635 from Jagudan has exhibited tolerance to cumin wilt. A total of 208 and 157 germplasm accessions have been maintained at Jobner and Jagudan centres. The cumin blight has been controlled by two sprayings with Dithane M-45 @ 0.2%. Top dressing with 30 kg N gives the highest average yield of 6.6 q/ha.

7. Coriander : Several selections like RCr 41, UD 40, Co-2, Lamsel-2, LS-287 have been found promising at the Jobner, Jagudan Coimbatore and Guntur centres. The variety Co-2 released as a dual purpose variety from Coimbatore could yield 500 kg/ha (dryland) to 800 kg/ha (irrigated) in 110 days; the Coimbatore centre has identified another selection viz. CS-287 which could be harvested in 70 days. In Rajasthan, it was confirmed that 50% leaf plucking in coriander done 70 days after sowing can give economic returns under irrigated conditions although there will be a reduction in the grain yield. At Jagudan, Var.GAU-1 gave the highest seed yield of 2 q/ha coupled with leaf cutting.

At Guntur, companion cropping of coriander with mustard gave a maximum gross income of Rs.8400/ha. A spacing at 30 cm within row gives highest production under Rajasthan conditions. Application of N @ 60 kg/ha in 3 doses gives 30% more yield under Rajasthan conditions. A total of 380, 301, 108 and 140 accessions have been maintained as germplasm at Jobner.

8. Fennel : The selection UF 32 gave the highest yield of 11 q/ha at Jobner. Selections VC-14-3-3 gave an yield of 5-9 q grain/ha at Jagudan and has been proposed for release as a variety. This selection matures in 120 days and contain 2.6% volatile oil. Fertiliser application @ N 15 kg and P 50 kg as basal dose followed by 15 kg N as top dressing increases yield of fennel in Gujarat. It has been found that foliar spray

with zinc and boron is helpful for the fennel crop. A total of 112 and 182 germplasm accessions have been held at the Jobner and Jagudan centres respectively.

9. Fenugreek : A dual purpose variety, Co-1 has been released in Tamil Nadu which gives 4 tonnes of greens/ha and 5-6 q of grain/ha. The root rot of fenugreek is caused by Rhizoctonia solani. At Jagudan, the leaf cutting,of fenugreek gave a maximum net profit of Rs.2,500/ha although this has adversely affected the grain yield. A total of 118, 170, 67 & 66 germplasm entries have been maintained at Jobner, Jagudan, Guntur and Coimbatore centres respectively.

(Dr. S. Edison)

INAUGURAL SPEECH BY SHRI SANT RAMJI HON'BLE MINISTER

Dr. M.R. Thakur, Vice-Chancellor, Dr. Y.S. Parmar University of Horticulture and Forestry, Dr. T.R. Chadha, Director of Research, Dr. S. Edison, Project Coordinator, All India Coordinated Research Project on Spices, Scientists and participants from different states of the country. I am happy to know that Dr. S. Edison, Project Coordinator, AICRP on Spices has selected Himachal Pradesh for holding 3 days' Workshop of All India Coordinated Research Project on Spices at Dr. Y.S. Parmar University of Horticulture & Forestry, Solan Nauni.

Spices have very important role in our food habits. There is no vegetarian or non-vegetarian preparation in which one or the other spices are not used. In different states, different spices crops are cultivated and I am sure that the 3-days Workshop will focus the attention of the participating scientists how to improve the production and quality of the spices so that the farmers get remunerative income and the consumers get good quality of spices.

In Himachal Pradesh, major spices crops being cultivated on commercial scale are ginger, turmeric, coriander and chillies. In addition to these, black zira grows wild in the dry temperate valley of Sangla valley of Kinnaur district and Pangi valley of Chamba district and Lahaul valley of Lahaul and Spiti district.

Cardamom (Moti Ilaichi) is being cultivated on a very small scale by the farmers in kitchen gardens in Mandi and Kangra districts.

Ginger - Ginger is one of the most important cash crop and is cultivated in an area of about 2,400 ha with a production of about 20,000 MT of green ginger. The crop is cultivated up to an altitude of 6,000' above sea level. In the low lying areas the crop is cultivated under irrigated condition whereas in the higher hills is rainfed.

The ginger cultivated in Himachal Pradesh has higher fibre content as compared to the ginger grown in north-eastern states. Similarly, the oil content in Himachal ginger is also much lower than the oil contents of the ginger grown in other states. The ginger crop is being affected by rhizome rot and the farmers are very much worried about the degeneration of the crops.

There is a need to evolve new variety of ginger in Himachal Pradesh which has a low fibre content, high oil content and resistant to rhizome rot.

Turmeric - Turmeric is being cultivated in the low and mid elevations of Himachal Pradesh but the produce is generally utilized locally. The cultivation of this crop does offer large scope because the colourof the local turmeric is dark yellow, the varietal improvement in this crop requires to be done for higher yields.

Chillies - Chillies are being cultivated in Himachal Pradesh in an area of 300 hectares which is spread in districts of Kullu, Mandi, Bilaspur, Sirmour, Una and Kangra. The local varieties are of the colour red and yellow. The Dr. YS Parmar University of Horticulture & Forestry has evolved Solan yellow, Pachhad yellow, Research work is in progress for evolving high yielding varieties.

Coriander - Coriander is cultivated in small pockets of Trans-Giri area of Sirmour district, the dry produce of which is exported. The area under coriander is restricted in the pockets of district Sirmour.

Kala Zira : Kala Zira has been found growing wild in the districts of Kinnaur, Lahaul-Spiti and Tehsil Pangi and Bharmour of Chamba district. Realising its importance as a spice and more valuable seed in Ayurvedic medicines, farmers can have a gross income of fifteen to twenty thousand rupees per hectare by growing Kala zira. It being a perennial crop, does not require planting year after year. Through experimental trials, it has been possible to domesticate Kala zira in higher elevations in dry temperate zone. In case of Kala zira, much research work has not been done. It can be a very remunerative crop for the farmers if some suitable high yielding variety is evolved.

Farmers are producing the spices by putting hard labour but they are discouraged when they find that they do not get remunerative price in the market. There is a big gap in the prices what farmer gets and what the consumer pays. Marketing of spices has to be improved in such a way that the major share goes to the producer.

With these words, I inaugurate 9th Workshop of All India Coordinated Research Project on Spices and wish all the success.

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Technical Session I	:	Action taken on the recommendations of the VIII Workshop.
Chairman	:	Dr. Ramphal
Rapporteurs	:	Dr. S. Edison Mr. T.A. Sriram

Technical Session I	:	Action taken on the recommendations of the VIII Workshop.
1. No. of papers presented:		The Project Coordinator presented the report on actions taken
2. Centres where work was done	:	15
3. Non performing centres, if any		The non-performance of Pampadumpara centre could not be discussed as there was no participation in the Workshop.
4. Brief description of the work done as well as re results reported	:	

The status on action taken on the recommendations of the VIII Workshop (conducted at Guntur during Jan-Feb 1987) was presented along with the Annual Report for the period July 1, 1986 - Dec. 31, 1987. The report was discussed in detail during this session and the statement on the action taken etc. is also reproduced in this session. The list of approved technical programmes for all the 15 centres during the VII Plan was also listed and the same has been reproduced at the end of this report.

This technical session had Dr. Ramphal in the Chair who in his opening remarks emphasised the need for seriously considering the recommendations of the VII Workshop and requested the individual centres to provide their status report on the actions taken and also invited the Project Coordinator to present his reactions. This has helped to remove the difficulties in implementing the programmes and decisions. He also emphasised that the very purpose of conducting repeated Workshops will be defeated if the action on the recommendations made during the previous Workshops are not implemented promptly.

be mentioned that the work on the quality analysis is not adequate especially in Solan & Johner centres. It was also pointed out that the weak link in technology transfer in spice crops is the lack of active cooperation needed from the State Agricultural Universities. It was also pointed out that there has been problems in release of varieties on perennial crops as well as of the spices. The multilocation trials had generated enough data to help proper evaluation of the performance of the high yielding accessions. The Project Coordinator informed the House that a special group meeting has been arranged during the Solan Workshop to discuss about the various aspects of Variety Release as well as consider proposals for Variety Release presented by the various centres.

An important task assigned to the delegates of the Solan Workshop has been to identify the thrust areas for the VIII Plan and also help formulate the future programmes and strategies to improve spices production through research.

Some of the centres like Sirsi & Chintapalli which have picked up in their performance during the last one year was welcomed by the ICAR and the Project Coordinator was asked to keep a close monitoring of performance of these centres in the coming years as well. It was also emphasised that problems like rhizome rot of turmeric in Andhra Pradesh have to be attended seriously, in view of the recommendations of the Guntur Workshop, 1987. The Project Coordinator informed the House that the Expert Team from NRCS which has visited the Telengana region of Andhra Pradesh - where the problem is more serious - and the action plan has already been submitted to the University authorities for implementation.

During the Guntur Workshop, several new trials, like irrigation-cum-fertiliser trial on pepper, new comparative yield trial in pepper and fenugreek, new multilocation trial in ginger, turmeric and cardamom, a few agronomic trials in minor spices were recommended and all these trials have been commenced as on date.

5.	Recommednations ready for transfer to extension agency, if any.	: See under sessional proceedings
6. (a, b & c)	Programmes proposed for the next year	: Details given under individual crops.

The action taken on the recommendations of the VIII Workshop held at Guntur is furnished in the following pages.

ACTION TAKEN ON THE RECOMMENDATIONS OF THE VIII WORKSHOP ON SPICES HELD AT GUNTUR DURING JANUARY 30 - FEB 1, 1987

Decision	Action taken/Remarks
I. GENERAL	
1. Sirsi & Chintapalli centres need to be critically reviewed about their performance and the Project Coordinator will keep a close monitoring of the centres and report to the Council	The Sirsi & Chintapalli centres have been visited regularly by the Project Coordinator to improve their performance. The Vice Chancellors and the Directors of Research of both the Universities were met at least twice during the last one year and requested to improve the working facilities at both these centres. The Plant Pathologist at Chintapalli has joined about six months ago and has been making some progress. The Sirsi centre has improved considerably over the past two years. Periodical reports are being sent to the Council.
2. The Jagtial, Guntur, Yercaud and Pottangi centres have needed additional scientific positions in Plant Pathology, Entomology & Agronomy respectively. The Guntur centre has proposed for re-conversion of the Jr. Agronomist post to Jr.Plant Pathologist.	The re-deployment of 1 Jr.Agronomist from Guntur centre to Jagtial centre and its further conversion as Plant Pathologist is under consideration of the ICAR; the APAU has agreed for this. The new Plant Pathologist at Jagtial will take care of the turmeric rhizome rot work in the light of the report given by the Expert Team on rhizome rot of turmeric

	Additional posts for Yercaud and Pottangi centres are proposed during the VIII Plan. The Guntur centre is in need of a Plant Pathologist and necessary re-deployement can be considered after receipt of the relevant proposal from the Director of Research.
3. The Solan centre has not been posting a proper Biochemist against the post of Biochemist and the ICAR has already issued necessary instructions.	The post of Biochemist was vacant for over an year and even earlier, a Botanist was posted against this post. After close pursuation with the University, the Jr. Biochemist has been posted only during Nov. '88 and perhaps for the first time the biochemical analysis could be initiated at the the Solan centre. However, the VIII Plan proposals for re-deployement may have to be re-considered.
4. A multidisciplinary team of scientists from IRCs to visit Andhra Pradesh and study the problem of rhizome rot of turmeric.	The Expert Team on rhizome rot of turmeric has since visited the Telengana zone of Andhra Pradesh accounting for the largest area under turmeric and which has the problem of rhizome rot to a serious extent. Detailed report of the action plan has since been communicated to all concerned and action initiated.

5. The NRCS will supply 1 kg seed in each of the turmeric germplasm accessions for testing in the hot spot areas.	The matter will be taken up with the Joint Director, NRCS for further action during Jan-Feb 1989.
6. There is a need for importing exotic germplasm in cumin, coriander, fennel and fenugreek especially from the Middle East and Mediterranean countries besides France, USSR etc.	The NBPGR has been requested to supply the seed materials by germplasm exchange. Two elite lines of fennel have been received from the NBPGR and distributed to the Jobner centre for multiplication and initial evaluation.
7. There is need for strengthening the NRCS, Calicut to undertake quality evaluation of spices especially for the materials received from the Coordinating centres.	A proposal to this effect has been made to the Director, CPCRI. The ICAR Hq. may have to provide additional support for this activity (if possible) in the VII Plan itself. However, a proposal for strengthening has been included in the VIII Plan.
8. The request for supply of planting material from one centre to another centre should be routed throrugh the PC together with specifications of the purpose.	Specific instructions have been issued in this regard and the centres are following this practice.
9. Four improved selections in ginger (PCS 35) turmeric (PCS 10), cumin (UC 19) and fennel (RF 14-3-5) were recommended for release and the proposals were to be submitted to the Central Variety Release Committee.	The Central Sub Committee for Crop Standards Notification and Variety Release has since approved the release of varieties in ginger viz. Suprabha, turmeric viz. Roma, cumin viz. Rz-19 and fennel viz. Gujarat Fennel-1. The University centres have been requested to provide the necessary set of package of practices.

10.	The Plant Pathological trials, newer fungicides like Ridomil and Aliette will be tested and the chemicals will be arranged by the Project Coordinator	The necessary quantities of the two fungicides besides the seed formulations viz. Apron-35 WS has been supplied to the Panniyur, Sirsi, Vellanikkara, Solan, Pampadumpara and Myladumpara (voluntary centre) centres and the chemicals used in the experiments in 1987, 1988 etc.
11.	It was decided to conduct a multilocation trial of turmeric with the improved selection from the NRCS viz. PCT-8 at different turmeric growing tracts in Andhra Pradesh.	This trial has been laid out in all the 3 turmeric growing tracts in AP viz. coastal Andhra Pradesh, Krishna-Godavari zone and the Telengana zones. About 2½ q of planting material has been supplied to the APAU for this purpose. The selection PCT-8 which has since been released as a variety "Suvarna" has been performing well in general although some of the new selections viz. PCT-13 & PCT-14 are also preferred in Andhra Pradesh.

II. SPECIFIC DECISIONS CROP-WISE

A. <u>PEPPER</u>

12.	The existing CYT at Panniyur may be concluded and a new CYT will be initiated at Panniyur & Sirsi.	The basic planting material for the trial has been supplied to both the centres and the same is under multiplication. The trials have since been laid out.
13.	The germplasm collection available at Sirsi and Chintapalli are not satisfactory. Collection of cultivated wild germplasm in Uttara Kannada dist. of Karnataka and Vizag dist. of Andhra Pradesh will be made during 1987.	The Sirsi centre has at present 52 entries in the germplasm which is more than double than what was two years ago. Survey for collection of germplasm in Uttara Kannada district has been undertaken by the Sirsi centre. The Chintapalli centre has initiated this activity in collaboration with the APFDC to locate the wild germplasm.

14.	The new experiment on irrigation cum fertiliser will be laid out in pepper at Panniyur and Sirsi centres.	The experimental design has been worked out and communicated. The planting has already been taken up at Panniyur and Sirsi centres during 1987; however, the treatments will be enforced only after the third year.
B.	CARDAMOM	
15.	A new multilocation trial will be conducted at Mudigere, Pampadumpara and Yercaud centres with 10 selections.	This trial has since been laid out at Mudigere and Yercaud centres. The Pampadumpara centre has not laid out the experiment inspite of our reminders; the matter is being pursued.
16.	The germplasm collections at Mudigere, Appangala, Myladumpara and Sakleshpur should be carried by exchange of planting materials between the Institutes and coordinating centres. Fresh surveys will also be undertaken.	The germplasm has been exchanged between Mudigere & Appangala centres. As regards the exchange between the NRCS, Appangala and ICRI, Myladumpara, necessary action remains to be taken in consultation with the Director, CPCRI. Survey for germplasm is being continued by the Mudigere & Appangala centres.
17.	The Schevroy hills, Kolli hills, Javvad hills and Kalrayan hills may be surveyed for germplasm by the Yercaud centre with the specific intention of locating any drought tolerant types.	About 100 clonal units of Malabar, Mysore & Vazhukka types have been collected by the Yercaud scientists; they also collected germplasm material from Mudigere & Appangala centres during July-August, '88. Further survey is being continued in collaboration with the Deptt. of Horticulture & Plantation Crops, Govt. of Tamil Nadu.

18.	Cardamom germplasm shall be maintained in a compact block as per the approved design to be supplied by the Project Coordinator.	Detailed descriptor list for cardamom as well as the design for maintaining germplasm has been supplied by the Project Coordinator and he has also visited all the cardamom centres and explained the work to the scientists. This work is making a steady progress.
19.	There is a need for undertaking experiments on the micro-nutrient requirements of cardamom.	Preliminary information is already available at the Mudigere centre The Mudigere and Yercaud centres have been advised to take up survey for micro-nutrient deficiency/sufficiency and determine the micronutrient status during 1987-88 & 1988-89 seasons. This work has so far been initiated at Yercaud centre.
20.	The existing glass house at Mudigere centre needs to be expanded and repaired on a priority basis to cope up with the increased work load in cardamom "clump rot" and "Katte".	The necessary repairs has since been carried out by the host University. Basic work on clump rot disease has been taken up at Mudigere centre.
21.	The experiment on control of Azhukal disease of cardamom needs to be re-laid by including newer chemicals.	A common technical programme has been worked out for Pampadumpara and Myladumpara centres (voluntary) and the experiments initiated during 1987 and is continuing.

22. It was decided to initiate a new multi-location experiment at Pamapdumpara, Yercaud and Mudigere centres for Katte resistance. The NRCS, Appangala will supply clones to all the three centres.

The available resistant clones to katte disease have succumbed to the disease and the proposal has to be deferred for its implementation.

23. As cardamom is a cross pollinated crop aided by honey bees, it is necessary to use "soft" and selective insecticides for control of cardamom pests and also to initiate work on biological control of key pests of cardamom.

The centres have been specifically advised about this important decision/recommendation and suitable care has been taken.

C. LARGE CARDAMOM

24. Germplasm collection in large cardamom has to be made from Sikkim, West Bengal and Arunachal Pradesh.

About 20 new accessions have been added to the germplasm collection in the Gangtok centre from all the 4 districts of Sikkim as well as some parts of Darjeeling district in West Bengal. The Director, ICAR Research Complex, Shillong has been requested to permit the Gangtok scientists to extensively survey the remaining areas in Sikkim and West Bengal. The officers of the Department of Agriculture as well as the ICAR Research Centre in Arunachal Pradesh have been consulted personally by the Project Coordinator to help the Gangtok scientists to take up survey of large cardamom. Accordingly, a survey was conducted and 5 types from Basar region of Arunachal Pradesh have been collected and planted at Tadung. Two more types were brought from Sikkim and at present a germplasm accession of 40 are present.

25. A CVT on large cardamom was to be initiated at the Gangtok centre	Thirteen selections have been identified and the trial has been laid out initially with 6 selections where sufficient planting materil was available; the remaining 7 selections are under multiplication.
26. The IARI Regional Station at Kalimpong as well as the Spices Board's Research development centre at Pangthong will be approached for collaborative work on large cardamom.	The Project Coordinator held detailed discussions with both these organisations and the scientists of the Gangtok centres who have assured necessary help in this respect. A need based collaborative programme especially for the diseases of large cardamom is being finalised. It is now understood that the IARI Regional Station has been temporarily shifted from Kalimpong to Gangtok/New Delhi and further action will be taken up on the recommendation during the next visit by the Project Coordinator to the Gangtok centre.
D. GINGER	
27. A new multilocation trial was to be initiated on ginger at Solan, Pottangi and Vellanikkara centres.	Six selections have been included under this trial which has been laid out in all the 3 centres.
28. The field control trial for rhizome rot will be modified as per the design at the NRCS, Calicut.	The technical programme of the Vellanikkara centre was suitably modified in the light of the experience by the Pathologists at NRCS; the Solan centre working at a different situation will however continue with the existing programme.
29. The mutant lines reported to be resistant to the rhizome rot of ginger at Pottangi will be tested at Solan centre and the NRCS, Calicut.	The planting material has since been supplied to the two centres for further testing.

E. TURMERIC

30.	A new multilocation trial was to be initiated in turmeric at Jagtial, Pottangi Vellanikkara and Solan centres besides Coimbatore as a voluntary centres.	Thirteen selections have been included in this trial and the trial has already been laid out.
31.	Two turmeric accessions viz. 15B and 21A from the Vellanikkara centre which were found to be highly productive was to be analysed for the yield data etc. including their performance at other centres.	The proposal for release of the turmeric selections 15B and 21A were considered during the Solan Workshop 1988 and the same were rejected by the Sub-Group constituted for the purpose.
32.	The germplasm collections at Solan and Vellanikkara may be strengthened by obtaining planting material from Calicut and Pottangi centres. The quality evaluation of all the accessions available at Solan is also to be completed at NRCS.	The two centres are yet to obtain the germplasm from the Pottangi centre and they have been remainded to depute their scientists to Pottangi and collect the germplasm. The quality evaluation at Solan will be taken up by the Biochemist preferably after he undertakes a training at NRCS, Calicut; this has been communicated to the Head of the Deptt. at the host University.
33.	The curcumin content in some of the turmeric accessions reported from Pottangi centre seems to be on the higher side and the PC will get them re-checked at the NRCS.	The material received has been analysed and necessary instructions have already been sent to Pottangi centre.

F. CUMIN

34.	A new experiment on the effect of crop geometry and seed rate of cumin will be taken up at Jagudan and Jobner centres.	This experiment has been laid out.

G. CORIANDER

35.	A new experiment on improvement of grain quality in coriander and the N application on yield are to be taken up at Jobner and Jagudan centres.	The experiment has been laid out.
36.	There is a need for taking up chemical control of the leaf eating caterpillar of coriander at Guntur centre.	Technical programme has been finalised and the Guntur centre has been reminded to take up the activity by making local arrangement.

H. FENNEL

37.	A new experiment on the effect of N on yield and quality of fennel, inter-cropping in fennel were to be laid out at Jagudan and Jobner centres.	This experiment has been laid out.

I. FENUGREEK

38.	A new experiment on the irrigation requirement combined with fertiliser levels for fenugreek was to be initiated at Jobner and Jagudan.	This has been laid out.

Technical Session II	:	GENETICS & PLANT BREEDING
Chairman	:	Dr. M. Rama Rao
Rapporteurs	:	Dr. H.M. Chandrappa Mr. Peter G.B. Vedamuthu

Technical Session II : Genetics & Plant Breeding

1. No. of papers presented: 13

2. Centres where work was done :
   - Cardamom - Mudigere, Pampadumpara and Yercaud
   - Pepper - Panniyur, Sirsi and Chintapalli
   - Ginger - Solan, Pottangi and Vellanikkara
   - Turmeric - Solan, Pottangi, Jagtial, Coimbatore and Guntur.
   - Minor spices Jobner, Jagudan, Guntur and Coimbatore.

3. Non-performing centres if any: Pampadumpara (Kerala Agril.Univ.) did not participated in the IX Workshop.

4. Brief description of work done and salient results reported

A. Cardamom

1. Results of comparative yield trial, multilocation trial and preliminary yield trials at Mudigere were presented. The new multilocation trial is reported to have been laid out and planting has completed. In the 6 x 6 diallel study, 40 progeny selections have been identified. The selections from the progeny of diallel cross (40 nos.) studied were being multiplied for further use. A new combining ability study to select suitable elite clone parents for further breeding work in cardamom is suggested as the old combining ability study has been vitieted.

2. At Yercaud, hybridization work was initiated in Malabar type based on capsule shape, viz. round medium and long capsule. A total of 1085 crosses were made in the above combinations and the F_1 seeds were evaluated. The results obtained from the MLT revealed APG-7 selections was found promising. They have taken up planting of new MLT. Clonal progenies of high yielding clones are being evaluated and they are reported to be having green bold capsules and tolerance to drought.

3. Mutation breeding studies with 4 varieties are in progress. Selections are taken up for dwarf plant type with narrow leaves in addition to drought tolerance. Interaction with other centres where similar work is going on is suggested.

4. There were no representatives from Pampadumpara and hence the results could not be reviewed. The Project Coordinator is requested to review the work of this centre.

B. Pepper

1. In the comparative yield trial at Panniyur centre, Kuthiravally, Karimunda and culture No.239 performed better. Culture 239 is an open pollinated material (Perumkodi) with extra bold berries. Intervarietal hybridization was conducted to evolve high yielding

varieties. Forty intervarietal crosses are being evaluated. Out of the 315 seedling progenies which came to bearing, culture 5128 recorded highest yield which has extra bold berries. Further evaluation is needed for their performance. The multilocation trial laid out in 1986 was in progress and has reached flowering stage. The new comparative yield trial is reported to be taken up for planting in the next year.

2. At Chintapalli, a comparative yield trial was laid out in August, 1986 with 9 cultivars obtained from the germplasm at NRCS, Calicut in a completely randomised design. Survival data and growth characteristics were recorded. A regular trial is yet to be taken up with local or proven check.

3. A new CYT has been initiated during August 1987 at Sirsi and Panniyur centres which include promising cultivars from PRS, Panniyur & NRCS, Calicut as per the recommendations of the Guntur Workshop.

C. Ginger

1. The new MLT initiated using 10 entries, one selection from Solan (SG 666) and four from Pottangi (PGS-35, PGS-9, V_1K_1-3 and V_2E_5-2), one from Vellanikkara (Maran), besides the high yielding selections namely PGS-35, PGS-198, PGS-9. Mutation breeding has taken up using gamma rays and EMS for inducing variability at Solan centre.

2. The different ginger collections available at Solan centre were evaluated showed that crude fibre content widely varied. The germplasm collection of ginger with low fibre content available at Solan may be spared to all other centres for multiplication and testing. The Solan centre may urgently fill up the post of Biochemist and complete the quality evaluation in ginger.

3. The ginger selection PGS-35 developed at MARS, Pottangi which was the top yielder out of 7 entries tried has been released as a variety and more than 5 MT of seed has been distributed. A new MLT with 6 cultivars has also been taken up during this year.

4. The old MLT conducted at Vellanikkara using 10 promising ginger types revealed that 'Bajapai' has given maximum yield of 14.64 T/ha, followed by Nadia. The recovery of dry ginger was maximum in Bajapai (24%) and Narasapattam(24%).

D. Turmeric

1. The evaluation trial carried out at Solan with different collections for yield showed that ST 323 recorded the maximum yield among the entries tested for two years.

2. The new multilocation trial initiated at Solan, Pottangi, Vellanikkara, Jagtial, Coimbatore, Calicut as decided by the Guntur Workshop. In total there

was 4 coordinating centres and one voluntary centre besides NRCS, Calicut. The design finalised was a simple RBD with individual plot size of 3 x 1 sq.m bed. All the centres must follow the uniform plot size as finalised. The cultivars included in this trial are Sel 3 and Sel 323 (from Solan) PTS-10, PTS-24, PTS-38 and PTS-9 (from Pottangi) Indonesia, 321 Ethamukulam and VK-70 (from Vellanikkara), Co-1 and BSR-1 (from Coimbatore) and PCT-2, PCT-5 and PCT-8 (from NRCS, Calicut).

3. At Pottangi, 150 turmeric accessions were evaluated; PTS-10 was found to be better out of the entries tested for 3 years and it has been released as a variety "ROMA". PTS-24 is also equally good with high fresh yield is also said to have been released by the Orissa State Government. In the new MLT trial taken up, the culture PTS-9 and PTS-11 have been reported to have recorded higher yields followed by PTS-10.

4. Germplasm collections are being evaluated at Vellanikkara where two CYT, one with 16 entries and another with 14 entries from the germplasm. In these trials VK-31, VK-32, VK-36, VK-48, VK-51 and VK-59 were promising with higher yields.

5. At Jagtial PCT-13 and PCT-14 have yielded better than other eleven entries in the MLT taken up last year (1987). Local variety used (Armoor) as check is of long duration & all the other 12 accessions of short duration. The

new MLT consisting of 10 varieties has been taken up in 1986-87.

6. It was suggested to have an ICAR centre near Bhavanisagar (Tamil Nadu) since the productivity and production level of the crop is good and the area under the crop is fairly high. The MLT conducted at Guntur and Krishna, Godavari districts of Andhra Pradesh have revealed PCT-8 to be highly productive than others.

E. Cumin

1. At Jobner a CYT with 12 exotic entries including a local check were evaluated separately. The result of the trial revealed that UD 198 cumin recorded the maximum yield among 12 entries and it was found resistant to wilt. UC 199 and GC-1 were next best.

F. Coriander

1. At Jobner two CYT were conducted with 18 entries including six from Rajasthan, six from Andhra Pradesh, two from Tamil Nadu, three from Gujarat with local varieties as control. The MLT revealed that UD 374 gave highest yield among 18 entries of the coriander tested and UB 21 was on par.

2. The experiments carried out at Jagudan showed, the exotic culture No.UC 198 (E.C. 109635) obtained from NBPGR is performing better and resistant to wilt.

3. At Guntur, selections CS 2, CS 4, CS 5, and CS 6 have been performing well and the centre should propose them for release as varieties as per the presscribed profonma.

4. In a trial conducted at Coimbatore for three years, three coriander entries viz. 718, 806, and 914 performed better than CO2. In a CYT consisting of 16 entries CS 287, CS 694 were high yielding than others and these two accessions ware ready for release. Mutation breeding has been initiated for creating variability and varietal improvements in coriander and nine M6 selections are being evaluated.

G. Fennel

1. Five entries of fennel from Rajasthan and one from Gujarat were evaluated along with a local check in a multilocation (varietal) trial at Jobner. Among the fennel varieties tested UF 90 gave maximum yield followed by UF 101 and UF-112.

H. Fenugreek

1. The CYT in fenugreek at Jobner conducted with 11 entries, UM 118 gave maximum yield followed by UM 117 out of 11 entries in the trial.

2. At Guntur, 65 entries of fenugreek collected from different agroclimatic regions were evaluated. Among those germplasm Methi-3 followed by Bolpur, JF-2 and M-24 were found high yielders. It is also suggested

that proposals be sent to release promising fenugreek cultures from Guntur next year.

3. At Coimbatore, 14 entries were compared for their performance. CO-1 and Acc.1084 were found to be tolerant to root rot compared to other fenugreek collections.

5.1 Recommendations ready for transfer to extension agency:

Varietal release :

a) Pepper culture No.239 from Panniyur

b) Ginger PGS 35 from Pottangi

c) Turmeric PTS 10 and PTS 24 from Pottangi

d) Coriander CS 287 and CS 695 from Coimbatore and CS 2, and CS 4 and CS 6 from Lam, Guntur.

6. Programmes for the next year :

A. CARDAMOM

1. Mudigere

1.1 Germplasm collection and description of types and varieties of cardamom.

1.2 Comparative yield trial of promising varieties of cardamom.

1.3 Combining ability studies in cardamom

1.4 Multilocation trial of selected cardamom clones

1.5 Mutation breeding in cardamom

2. Yercaud

2.1 Germplasm collection and evaluation

2.2 Multilocation trial of selected cardamom clones (1984 & 1988)

2.3 Mutation breeding in cardamom

B. PEPPER

1. Panniyur

1.1 Germplasm collection and evaluation

1.2 Hybridization in pepper

1.3 Multilocation trial of promising collections (1986 & 1988)

2. Chintapalli

2.1 Comparative yield trial of selected varieties in pepper

2.2 Germplasm collection and evaluation in pepper

3. Sirsi

3.1 Comparative yield trial of selected varieties in pepper

C. GINGER

1. Solan

1.1 Germplasm collection and maintenance of ginger

1.2 Evaluation of promising clones of ginger

2. Pottangi

2.1 Germplasm collection and evaluation of ginger

2.2 Multilocation trial of selected varieties of ginger

2.3 Initial evaluation trial of promising cultures of ginger

3. Vellanikkara

3.1 Germplasm collection and evaluation in ginger

3.2 Multilocation trial of selected varieties of ginger

D. TURMERIC

1. Solan

1.1 Germplasm collection and evaluation in turmeric

1.2 Evaluation of promising clones of turmeric

2. Pottangi

2.1 Germplasm collection and maintenance in turmeric

2.2 Multilocation trial of selected varieties of turmeric

2.3 Initial evaluation of promising entries of turmeric

3. Vellanikkara

3.1 Germplasm collection and maintenance in turmeric

3.2 Multilocation trial of selected varieties of turmeric

3.3 Initial evaluation of promising entries of turmeric

4. Jagtial

4.1 Germplasm collection and maintenance in turmeric

4.2 Multilocation trial of elite cultivars of turmeric

4.3 Multilocation trial of selected varieties of turmeric

4.4 Multilocation trial on turmeric

5. Coimbatore

5.1 Multilocation trial of selected varieties of turmeric

5.2 Germplasm collection and evaluation in turmeric

6. Guntur

6.1 Multilocation trial of selected varieties of turmeric

6.2 Germplasm collection and maintenance in turmeric

B. MINOR SPICES

1. Jobner : Cumin, coriander, fennel & fenugreek

1.1 Collection, maintenance and evaluation of germplasm

1.2 Coordinated comparative yield trial/multilocation trial of selected varieties

2. Jagudan : Cumin, coriander, fennel & fenugreek

2.1 Collection, maintenance and evaluation of germplasm

2.2 Coordinated comparative yield trial/multilocation trial of selected varieties.

3. Guntur : Coriander & fenugreek

3.1 Collection and evaluation of germplasm

3.2 Evaluation of promising selections

3.3 Comparative yield trial

4. Coimbatore : Coriander & fenugreek

4.1 Collection and evaluation of germplasm

4.2 Coordinated comparative yield trial.

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Technical Session III	:	GERMPLASM
Chairman	:	Dr. M. Rama Rao
Rapporteurs	:	Dr. H.M. Chandrappa Mr. Peter G.B. Vedamuthu

Technical Session III : Germplasm

1. No. of papers presented : 14
2. Centres where work was done : Cardamom- Mudigere, Yercaud and Pumpadumpara
   Pepper - Panniyur, Sirsi and Chintapalli
   Ginger - Solan, Pottangi and Vellanikkara
   Turmeric- Solan, Vellanikkara Jagtial and Pottangi
   Minor Spices - Jobner, Jugudan, Guntur & Coimbatore
   Large Cardamom- Gangtok.
3. Non-Performing centres if any : There were no representatives and hence no presentation from the Cardamom Research Station, Pampadumpara. The Project Coordinator is requested to elicit reasons for their absence and review their performance.
4. Brief description of work done and salient results reported.

A. <u>Cardamom</u>

1. The collection of germplasm at Mudigere have shown a considerable progress. Seedlings of Handi Selection having bold capsules were raised. The necessity for close observation on the bold capsuled Handi selection was emphasised. Documentation of the germplasm, based up on the keys developed by the Spices Board was recommended.

2. For adding up new germplasm, it was suggested that the Singampatti accession in Tamil Nadu should be surveyed exhaustively jointly by the NRCS, Calicut and Spices Board to recover the valuable germplasm available there.

B. Pepper

1. A systematic and detailed survey conducted from the Northern districts of Kerala added a large collection of germplasm in Panniyur to the highest viz. 70 cultivated, 117 wild types. Cataloguing is to be done in a systematic basis. They may be suitably documented and presented in the next workshop.

2. The germplasm assemblage at Chintapalli is not satisfactory and special efforts should be made to survey the local area around to collect both cultivated and wild types. They may also introduce the germplasm available at Panniyur.

3. In Sirsi, different varieties/cultivars had been collected and added to the earlier collection increasing to 50 cultivated and 20 wild accessions of pepper. They may be suitably documented. It is believed that the north Kanara forests have immense wealth of wild and cultivated germplasms in pepper which may be lost due to denuadation of forest in due course. Hence a time bound survey may be taken up after discussion with Dr. M.K. Nair, who had earlier conducted similar expeditions in this zone. The Spices Board may also help in the activity.

C. Ginger

1. At Solan three more accessions namely Nadia, Awacho and Sadhupul were added to the existing germplasm collection of 32, which are considered good for quality and yield. These collection were evaluated for yield, ginger oil and crude fibre content. Different morphological characters were also recorded. The collection SG 666 gave maximum yield of 5.8 Kg/plot of 4 x 1m, at Solan. The ginger oil contents of SG 568(2.5%) and Nadia (2.5%) were found to be the highest. The crude fibre content varied from 2.6% (Jamaica) to 9.12% (SG 511) showing lowest in Jamaica. It was emphasised that the trials need to be conducted as per the recommended plot size (3m x 1m) and there should not be any deviation.

2. At Pottangi the 84 germplasm accession were evaluated and among them Jamaica recorded maximum yield of 2.61 Kg/$2M^2$ followed by Wynad local (1.74 Kg/$2M^2$) and PGS - 1 (1.55Kg/$2M^2$) Maximum dry ginger recovery was obtained from the collection PGS-16 (34%) followed by Turia local-2(31%) and Turia local-1(30%).

3. It was reported that all PGS types were highly susceptible to soft rot and the variety Bajpai recorded highest yield of 5.95 Kg/plot and high dried recovery of 24% in Vellanikkara. The low fibre variety Awacho should be supplied to all the coordinating centre by Solan and efforts should be made to introduce low fibre varieties from Indonesia through NPBGR.

D. Turmeric

1. At Solan 46 Collections of turmeric were evaluated for different growth parameters and yield. The highest yield of 10.9 Kg/plot was recorded with ST 77 followed by ST 291 (8.1 Kg), ST 954 (7.5 Kg), ST 34 (7.2 kg) and ST 55 (7.2 Kg). The need for vigorous activity to increase the assemblage of germplasm is emphasised.

2. The turmeric accession in Pottangi has increased to a sizable number of 150. Pottangi holds the maximum number of accessions and were evaluated. The evaluation of the accessions have shown that PTS-35 and Amritapani recorded higher yield of 9 Kg/$3m^2$ and they are superior to VK 5. PTS-48 gave highest recovery (33%) of dry ginger.

3. At Vellanikkara 30 accessions were evaluated in two separate field trials. In the first experiment Ca-Chayapasapu and Cl. No. 443 which gave maximum 8.6 Kg. and 8.33Kg/$2M^2$ plot respectively followed by NBPGR-1. The maximum crude yield of 1.595 Kg/$2M^2$ obtained with Cl. No. 433 followed by Ca-Chayapasapu (1.579 Kg.) and NBPGR-1 (1.337 Kg.). In the second trial, the type "321 Ethamukulam" recorded the maximum yield of 8.60Kg/$2M^2$ plot followed by Jamaica (8.61 Kg/$2M^2$).

4. The Germplasm collection in Jagtial centre has increased to a sizable no. of 50 Turmeric assemblage and evaluation work has been progressing. It is suggested that survey of germplasm be taken up from the traditional production centres located in Krishna Godawari tracts as well as the tribal areas (hills) in Nizamabad and Adilabad districts to increase its assemblage.

5. The germplasm collection of 105 accessions at the Coimbatore (Voluntary centre) was appreciated for their vigorous activity in increasing the assemblage and their request for upgrading them as regular centre may be considered in VIII Plan.

6. The breeder at the Pottangi centre may be supported by a Junior Breeder since Pottangi has the largest collection of both turmeric and ginger germplasms. This would help in catalouging germplasm and its further utilization. The new turmeric varieties from Maharashtra like Krishna and Sugandam and the all elite cultivars from Anantharajupeta of Andhra Pradesh University may be collected and tried in other centre also.

E. Cumin

1. The Jobner centre maintained 199 accessions in cumin and their evaluation showed that the variability was high for days to maturity, umbells/plant and association existed between umbelletes/plant and yield. However all the entries are susceptible to mildew and blight and they showed varied level of wilt incidence.

2. At Jagudan 56 germplasm accessions were maintained. The need for exotic introduction was emphasised especially from Middle East for Crop improvement.

F. Coriander

1. The germplasm accessions maintained at Jobner was374 including two exotic types. These germplasm entries were studied for the yield contributing characters. Wide variation is observed for all parameters, except for essential content. Based upon the parameters studied they have been grouped into 18 clusters. Correlation studies have indicated that the parameters like umbells/plant umbellates/plant and branches/plant can be taken as selection indices for crop improvement.

2. The Jagudan centre maintained a germplasm collection of 301 accessions and observations recorded on their growth and yield charactors.

3. At Guntur 120 accessions of coriander germplasm were maintained and evaluation of them were carried out. The yield levels will generally low due to moisture stress and maximum yield was noticed in Gadwal and yield of 438 Kgs per hectare followed by Cuddapah of 426 Kg per hectare and Seethanagaram at 411 Kg per hectare.

4. A total of 159 accessions are maintained at Coimbatore centre and observations on growth and yield characters recorded. Evaluation of all the selections revealed variation for all characters except oil content.

5. The scope for improving yield by selection in the existing material is limited, since already an yield plateau has been reached in coriander on the selection process. The variability in this crop could be increased for all characters through mutation breeding except oil

content. Hence it was felt that the high oil containing varieties of Poland and USSR should be introduced through the NPBGR to help the breeders to evolve varieties with high oil content.

G. Fennel

The Jobner centre maintained 119 accessions while Jagudan and Guntur centres maintained 179 and 24 accessions respectively. Evaluation of germplasm revealed that variability exists only for branches/plant umbells and umbellates/plants.

H. Fenugreek

Eighty four accessions were raised during the period and the variation for biometric characters were found to be wide in Coimbatore. Jobner centre maintained 112 accessions while 117 entries are maintained at Jagudan and 40 at Guntur. Evaluation of these accessions revealed that wide variations existed for almost all yield contributing characters, except for branches/plant. The need for importing exotic germplasm through NPBGR from Algeria, Moracco and other countries were accepted.

I. Large Cardamom

A very exhaustive survey for the germplasm collection was carried out and the collection is in progress adding up new accessionsto the existing types. The work on germplasm collection needs to be strengthened and intensified with the assistance of Spices Board.

The need to include the varieties of the single capsule progeneis in the existing germplasm was emphasised.

5. Recommendations ready for transfer to extension agency if any : NIL

6. Technical Programme for next year

Germplasm collection, maintenance and evaluation.

Cumin	:	Jobner & Jagudan
Coriander	:	Jobner, Jagudan , Coimbatore & Guntur
Fennel	:	Jobner and Jagudan
Fenugreek	:	Jobner, Jagudan , Coimbatore & Guntur

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Technical Session IV	:	AGRONOMY & SOIL SCIENCE
Chairman	:	Dr. K.G. Shanmugavelu
Rapporteurs	:	Dr. A.K. Sadanandan Mr. D.S. Bhatti

Technical Session IV	:	Agronomy & Soil Science
1. No. of papers presented	:	All centres presented their report except Pampadumpara.
2. Centres where work was done	:	Cardamom - Mudigere & Yercaud Pepper - Panniyur & Sirsi Ginger - Pottangi & Solan Turmeric - Pottangi & Solan Coriander - Jobner & Guntur Minor spices Jobner
3. Non-performing centres, if any	:	No scientist from Pampadumpara participated.
4. Brief description of work done and salient results reported.		

A. CARDAMOM

1. The results of 3^3 NPK manurial experiment at Mudigere and Yercaud centres were presented. In Yercaud centre, the existing trial will be closed and new experiment will be laid out under natural field conditions. The local variety (Malabar) will be used as the test crop. The technical programme approved in 1983 Workshop will be followed.

2. At Mudigere, the old 3^3 NPK trial and the 2^3 NPK trial initiated during 1983 were under progress and will be continued. The effect of these treatments on the number of suckers, panicles and yield could be obtained for evaluation.

3. At Pampadumpara, the 3^3 NPK trial was laid out during 1984 but results could not be discussed since the centre did not participate in the Workshop.

4. Micronutrient requirements of cardamom were studied at Mudigere and Yercaud. Hydroponic studies were under progress to study the deficiency symptoms of trace elements

viz. Mn, Zn, Cl, Cu, and Mo at Mudigere. Based on the recommendation of the Guntur Workshop, surveys were initiated to ascertain sufficiency/deficiency of micronutrients before proper experiments could be formulated. While the Yercaud centre had initiated the survey work, the Mudigere centre is yet to commence the survey. The report should be ready and presented in the next Workshop.

5. A new drip irrigation trial has been proposed for Mudigere, Pampadumpara and Yercaud centres. The infra-structure facilities will be provided by the ICRI, Spices Board. The technical programme will be formulated with the help of the Director, Water Technology Centre, TNAU, Coimbatore. The Project Coordinator (Spices) will initiate action to implement the drip irrigation trial.

6. A new mulching experiment of the use of mulch in cardamom will be initiated in all the 3 centres, Yercaud, Mudigere and Pamapadumpara as proposed in the Workshop. The technical programme and lay out will be formulated by the centres in consultation with the Project Coordinator for implementation.

B. PEPPER

1. An irrigation cum fertilizer experiment on Panniyur-1 and Karimunda was laid out after Guntur Workshop in split plot design with 3 levels of irrigation and 3 levels of nutrients. Rooted cuttings were also planted in June 1987 at the Panniyur centre.

2. A similar experiment has been initiated at Sirsi centre also. At Sirsi, different treatments may be suitably modified to suit the needs of situation since arecanut palms are used as standards. The concerned scientist should formulate the treatments and submit to the Project Coordinator for further action. Instead of Karimunda, the locally popular variety Malligessara has been decided.

C. GINGER

1. The studies on the effect of intercropping and mulching in ginger were carried out at Pottangi and Solan centres.

2. At Pottangi, the ginger cultivar PGS-35 was intercropped with Niger, French bean, Blackgram and Horsegram. Each bed of 3 sq.m. consisted of 60 ginger plants and had six rows of intercrops. Second and third mulching were not done in the intercropped beds. Pure crop of ginger with all the three applications of mulch served as control. No significant differences were seen among the treatments; however, pure crop gave the highest yield. This experiment was started in 1986 and will be continued for one more year. The seed used for the inter-crop will be however regulated to get better conditions like shade and soil moisture to the main crop of ginger.

3. At Solan, an experiment was conducted to know the effect of different mulches on the growth and yield of ginger. Mulching with pine needles combined with application of farm yard manure gave the highest yield in 1986-87. The experiment will be continued and the economics should also be worked out after two more seasons.

4. Another experiment on the effect of size of seed rhizome on the growth and yield is also initiated in 1986-87 at Solan. Seed rhizomes having different weights were sown and different growth parameters were recorded besides yield. It was found in the initial studies that seed rhizomes weighing 20-25 g promoted maximum growth of the plant gave maximum yield. The Workshop suggested the yield per hectare and cost:benefit ratio should be furnished to make a final recommendation.

D. TURMERIC

The intercropping experiment in turmeric conducted at Pottangi with selection PTS-24 intercropped with Niger, French bean, Blackgram and Horsegram. The second and third mulchings were not done in the intercropped treatments. Pure crop with all the three applications of mulch served as control. Though there was no significant difference among the treatments pure crops gave the highest yield. The experiment will be continued for another year and the pooled data should be analysed statistically. The cost:benefit ratio should be worked out and presented in the next Workshop.

E. CORIANDER

1. In the on-going fertiliser experiment at Guntur, Phosphate management is also to be added to the trial to find the response of coriander to applied phosphorus. The trial was laid out with selection CS-2 with 5 levels of P as super phosphate. Highest grain yield was recorded in the treatment 40 kg P_2O_5/ha in the existing trial. However, differences among treatments were non-significant.

2. The second experiment is on the effect of mixed cropping with mustard at Guntur centre. The trial will be modified using mustard and safflower to be grown with uniform population.

3. The experiment on the effect of leaf plucking on coriander at Jobner and Jagudan may be concluded in view of confirmatory results that 50 per cent leaf plucking is economical in selections PS 360, GAU-1, UD 354 and UD-3.

4. The experiment to assess the effect of time of nitrogen application on the yield of irrigated coriander at Jobner and Jagudan was initiated in 1987 will be continued without any change in the technical programme. The variety R.Cr.41 will be used at both the centres with 60 kg N application at different combination in different periods. It was decided that the Haryana Agricultural University, Hissar will be a voluntary centre and conduct the above trial from 1988 onwards.

5. The new experiment for improvement of grain quality by harvesting at different maturity levels initiated in 1987 at Jobner and Jagudan will be continued. There will be 3 stages of harvest viz. at full size grown and green colour, at 50% grains turning yellow and at 100% grains turning yellow. The design and lay out of the experiment is RBD with 3 replications and with 3 varieties of the crop.

F. CUMIN

1. The ongoing experiments at Jobner and Jagudan on the effect of nitrogen and phosphorus on the yield and yield attributes may be concluded in view of the confirmatory results obtained during the last 3 years. The results will be presented in the next Workshop.

2. It has been observed from 3 years' data at Jobner that weed control is a must for cumin cultivation. Terbutryn @ 10 kg a.i./ha could be recommended for weed control in cumin. In view of the conclusive data obtained, the experiment may be concluded. However, the efficacy of the weedicide in respect of economics has to be worked out for making the final recommendation; the details will be presented in the next Workshop.

3. The effect of crop rotation on the yield and wilt infection of cumin at Jagudan and Jobner started in 1984 are in progress and the data will be available after the rotation cycle is over.

4. A new experiment to study the effect of crop geometry and seed rate of cumin initiated in 1987 at Jagudan and Jobner will be continued. A seed rate of 8, 10, 12, 14 and 16 kg/ha is adopted. The geometry will vary at row spacing of 15, 22,5 and 30 cm between rows and compared to the traditional methods of broadcasting. The design is simple RBD, plot size 9.6 sq.m (4 x 2.4 m) and replicated four times.

G. FENNEL

1. The experiment on effect of nitrogen and stage of umbel picking on yield and quality of fennel initiated in 1985 at Jobner may be concluded in view of the conclusive results obtained.

2. The new experiment on intercropping in fennel initiated in 1987 at Jobner and Jagudan will have to be continued. This experiment has 10 treatments with a RBD design, replicated thrice.

H. FENUGREEK

1. The experiment on effect of leaf cutting and yield at Jagudan and Jobner started in 1983 will be concluded since conclusive results have been obtained.

2. The new experiment on irrigation and application of phosphorus on yield and yield attributes initiated in 1987 at Jagudan and Jobner will be continued. Four irrigation levels based on IW/CPE ratios of 0.4, 0.6, 0.8 and 1.0 has been given and the P levels imposed are 0. 20, 40 and 60 kg P_2O_5/ha. The cultivar used is Prabha (NLM) with a design of split plot with irrigation in main plot and the P levels in sub plots. The Haryana Agricultural University has been selected as a voluntary centre to conduct the trial from 1988 onwards.

5. Recommendations ready for transfer to extension agency, if any:

1. In coriander, plucking of 50 per cent of the foliage when the crop is 60-75 days old was found economical in varieties PS 360, GAU-1, UD 354 and UD-3 under Jobner conditions.

2. In cumin, basal application of phosphorus at 20 kg/ha (as single super) and application of N as urea @ 30 kg per ha immediately after weeding when the crop is 30 days is recommended for Jobner region.

3. In weed control trial in cumin, application of Terbutryn at 1 kg/ha or Oxidiazon at 0.5 kg per ha as pre-emergent spray is recommended for Jobner.

4. In fennel, application of N at 90 kg/ha (as urea) in three equal split doses at the time of sowing, 45th day and 120 days (flowering time) over a basal dose of 40 kg P_2O_5 (as super) is recommended for Jobner region.

5. In fennel, picking umbels at fully matured green stage i.e. before turning yellow is ideal to get optimum return.

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Technical Session V	:	PLANT PATHOLOGY
Chairman	:	Dr. D.N. Srivastava
Rapporteurs	:	Dr. M.N. Venugopal Dr. V. Prakasam

Technical Session V : Plant Pathology

1. No. of papers presented : 17

2. Centres where work was done :

Cardamom	: Mudigere & Pampadumpara
Pepper	: Chintapalli, Sirsi & Panniyur
Ginger	: Solan, Vellanikkara
Turmeric	: Vellanikkara & Jagtial
Coriander	: Jobner, Jagudan & Coimbatore
Large cardamom	: Gangtok
Minor spices	Jobner & Jagudan

3. Non-performing centres if any : Pampadumpara; no participation from the centre in the Workshop.

4. Brief description of work done and salient results reported :

A. CARDAMOM

At Mudigere, experiements in cardamom in evolving Katte tolerant varieties and control measures against Katte disease revealed that roguing is effective in containing the disease at a manageable level. In 1987, the seeds were treated with 0.2%, 0.3% or 0.4% EMS and all the test entries and M_1 seedlings (EMS) were however found susceptible to katte virus infection.

Fusarium oxysporum, a consistent isolate from cardamom root was found to cause typical wilt symptoms on cardamom seedlings under artificial inoculation.

B. PEPPER

The existing technical programme for control of quick wilt disease will continue. At Panniyur, the ten year data (May 1976 to December 1986) on weather parameters were analysed. It was found that the disease incidence, more or less followed the annual rainfall pattern. Intensity of the disease incidence was the

maximum in July, when weather parameters like rainfall, number of rainy days and relative humidity were the highest. A multiple linear regression equation has been developed using all the weather variables for predicting quick wilt incidence. The equation had a multiple correlation coefficient (R) of 0.892, accounting for 79.57% of the variability in the disease incidence; it was significant at 1% level. The actual and estimated values of the incidence of the disease using the above equation showed that the multiple linear regression equation using the different combinations of weather variables worked out, provided a good model for disease prediction.

The field control trial for quick wilt started in 1985-86 with different treatments at Panniyur/Sirsi found that Ridomil and Bordeaux mixture were effective in controlling quick wilt of pepper. This experiment will be continued with use of Ridomil-Mancozeb (instead of Ridomil) and also include Aliette.

C. GINGER

In an experiment to evolve control measures against soft rot at Vellanikkara and Solan revealed that seed treatment with Dithane M45 was found to be effective in increasing germination of seed rhizome and reducing pre-emergence rot, post-emergence rot and rhizome infection.

In another experiment, effect of 8 treatments of fungicides on the incidence of rhizome rot and the effect of germination was studied. In the different treatments tested, Ridomil (0.25%) is found effective in increasing germination of seed rhizome; Ridomil was used in the form of Apron 35WS.

Experiments at Solan on the rhizome rot pathogenicity revealed that Fusarium oxysporum is pathogenic on ginger and it causes typical wilt symptoms.

D. TURMERIC

Observations revealed that rhizome rot of turmeric is assuming in alarming proportions in many potential turmeric growing tracts in Andhra Pradesh. It is a very serious problem and needs immediate attention. The expert team from NRCS has since visited the Telengana zone and an action plan has been worked out.

E. CORIANDER

Studies on grain mould disease of coriander at Coimbatore was in progress and several lines were screened for resistance. This disease is causing considerable damage in three major coriander growing areas in Tamil Nadu. At Coimbatore, the accession No.695 recorded less wilt and powdery mildew incidence in coriander.

F. CUMIN

Studies were carried out on the control of cumin wilt by soil amendments with oil cakes and crop rotation. The results revealed that soil amendments with neem and mustard cake and crop rotation with bajra are effective in managing the wilt problem in cumin. The exotic accession No.1098635 is found to be a promising wilt tolerant line.

G. FENUGREEK

In the major fenugreek growing areas of Tamil Nadu a new disease with typical phyllody symptoms is assuming importance.

H. LARGE CARDAMOM

A survey conducted locally to find out the incidence and extent of damage by two viral diseases in different varieties. Survey revealed that Chrikey and Foorkey are less important and reported only 1-2, and 2-6% mean incidence respectively. Amongst the four commercial cultivars "Golsai" showed very low incidence of disease in the plantations. Survey also revealed the serious incidence of wilt (Fusarium oxysporum), leaf streak (Pestalotiopsis sp.) and panicle rot in large cardamom.

5. Recommendations Nil

6. Decisions taken :

A. Cardamom :

(i) Screening procedure for katte disease should be re-standardised.

(ii) Role of Fusarium oxysporum in the wilt of cardamom should be re-standardised.

(iii) The efficacy of fungicides viz. copper oxychloride, Dithane M45, Difolatan and Bavistin on the Pestalotiopsis leaf blight should be studied.

B. Black pepper

(iv) The compatibility of Ridomil with Bordeaux mixture for the control of quick wilt should be studied.

(v) New chemical control trials for quick wilt of pepper has to be formulated at Chintapalli and Sirsi.

C. Ginger

(vi) For planting ginger seed rhizomes, number of eyes should be taken rather than on weight basis.

D. Minor Spices

(vii) Work should be intensified to screen for wilt resistance in cumin.

(viii) Exotic types of cumin may be imported to locate wilt resistant sources.

(ix) Seed borne nature of cumin wilt may be studied.

(x) Standardise the method of inoculation for screening lines and disease reaction to wilt of minor spices.

(xi) The mycotoxin production in the grainmould infected coriander may be studied.

(xii) The etiology and causative agent and mode of transmission of red leaf disease of coriander has to be studied.

(xiii) Survey may be made in major coriander growing belts of India for grain mould and red leaf disease.

(xiv) The etiology, causative agent and mode of transmission of Phyllody - like disease of fenugreek may be studied.

(xv) The field tolerance nature of UD 373 and UD 374 to coriander powdery mildew and wilt should be tested for a few more seasons.

(xvi) The field tolerance of Co2 and culture No.1084 fenugreek accessions may be confirmed under the ongoing CYT programme against root rot. The field experiments with soil amendments and antagonistics may be concluded with one more season study and new programme has to be formulated with combination of antagonistics and soil amendments as follows :

a. Seed pelletting with Trichoderma viride to FYM @ 10 Ql/ha
b. Seed pelletting with T. viride + Neemcake @ 10 Ql/ha
c. Soil application of T. viride
d. Soil drenching with 0.1% carbendazium.
e. Control

Technical programme for 1989

A. Cardamom (Mudigere)

1. Screening for 'Katte' disease
2. Katte disease management in established gardens
3. Effect of 'Katte disease' on growth and development of cardamom.
4. Survival studies on Phyllosticta elettariae
5. Chemical control of nursery leaf spot of cardamom
6. Screening for resistance to leaf spot.

B. Large Cardamom (Gangtok)

1. Survey of large cardamom plantations for finding out the tolerant cultivars of large cardamom against Foorkey and Chirkey under natural conditions.
2. Survey for major fungal diseases.
3. Fungicidal evaluation against leaf blight and leaf streak diseases.
4. Investigations on panicle rot disease

C. Pepper

Chintapalli

1. Survey for the incidence of quick and slow wilt disease of pepper in Visakhapatnam and East Godavari districts of Andhra Pradesh.
2. Studies on the etiology of slow and quick wilt diseases.
3. Chemical control of slow and quick wilt of pepper with systemic and non-systemic fungicides.

   The fungicides included are :

   a. Bordeaux mixture
   b. Captan
   c. Metalaxyl
   d. Aliette

Pepper Research Station, Panniyur, Sirsi

1. Ecological studies on quick wilt disease (Panniyur)
2. Field trial for the control of quick wilt (Sirsi, Panniyur)
3. Observational trial for the control of quick wilt (Panniyur)
4. Studies on the control of nursery disease (Sirsi, Panniyur)
5. Field trial for the control of slow wilt (Panniyur)
6. Screening pepper cultivars and cultures against quick wilt (Panniyur)
7. Studies on biological control of quick wilt (Panniyur)
8. Effect of soil amendments on the incidence of quick wilt (Sirsi)

D. Ginger (Solan)

1. Effect of seed treatment on rhizome rot of ginger will be continued with the following treatments. Ridomil, Afron, Bavistin, Blitox, Captan, Dithane M45, Dithane M45 + Bavistin and control.
2. Varietal screening to rhizome rot and Phyllosticta leaf spot shall be continued.
3. Studies on the F. oxysporum invation in the vascular tissues.

Vellanikkara

1. Seed treatment trial with following treatments should be continued.

Captaf	0.2%	Apron 35WS	0.7%
Captafol	0.2%	Blitox	0.3%
Dithane M45	0.3%		

2 Seed control trial for soft rot should be continued.

Treatments :

Captaf 5G @ 50 kg/ha	Dithane M45 0.3%
Captafol 5G 50 kg/ha	Neem cake @ 500g/sq
Cheshunt compound	Bordeux mixture 1%
Ridomil MZ 0.25%	control
Ridomil MZ 0.4%	

3. Varietal screening for tolerance/resistance to soft rot
4. Etiology of dry rot in ginger

E. Turmeric (KAU, Vellanikkara)

1. Etiology of dry rot of turmeric

Regional Agricultureal Research Station, Jagtial

1. Survey of turmeric growing areas for assessing incidence of various diseases in Andhra Pradesh.
2. Management of Colletotrichum leaf spot with fungicides
3. Management of rhizome rot of turmeric using fungicides.
4. Screening turmeric germplasm lines for diseases.
5. Isolation of organisms associated with rhizome rot of turmeric and proving pathogenicity.
6. Studies on storage rot of turmeric.

F. Minor Spices

(i) Cumin (Jobner, Jagudan)

1) Screening of germplasm against cumin wilt under artificial conditions.

2) Use of new fungicides to control wilt
3) Studies on the seed borne nature of wilt pathogen.

(ii) Coriander (Jobner, Jagudan)

1) Screening coriander elite material for tolerance
2) to stem gall and root know nematode.

Coriander (Coimbatore)

1) Fungicidal control trial for the control of grain mould should be continued.

2) Survey has to be made in the coriander belts for grain mould and red leaf disease.

3) The etiology and causative agent and mode of transmission of red leaf disease has to be studied.

4) Field tolerance of UD 373 and UD 374 to powdery mildew and wilt should be tested.

(iii) Fennel (Jobner and Jagudan)

1. Varietal reaction of fennel cultivars to various diseases of fennel.

(iv) Fenugreek (Coimbatore)

1. Screening fenugreek varieties for powdery mildew, root rot and root know nematode.

Fenugreek (Jobner, Jagudan)

1. Root rot control trial will be modified with the following new treatments.

   i) Seed pelleting with Trichoderma viride + FYM @ 10 Q1/ha.
   ii) Seed pelleting with T. viride + neem cake @ 10 Q1/ha
   iii) Soil application of T. viride
   iv) Soil drenching with 0.1% Carbendazim control (Coimbatore)

2. The etiology , causative agent and mode of transmission of phyllody like disease should be studied (Coimbatore)

3. Field tolerance of Co-2 and culture 1084 should be confirmed under ongoing CYT (Coimbatore)

Technical Session VI	:	ENTOMOLOGY, BIOCHEMISTRY & PHYSIOLOGY
Chairman	:	Dr. G.S. Dogra
Rapporteur	:	Dr. T. Prem Kumar

Technical Session VI	:	Entomology, Biochemistry & Plant Physiology
1. No. of papers presented	:	Only one paper on Plant Pathology (Evolving drought tolerance in cardamom varieties)
2. Centres where work was done	:	Cardamom - Mudigere centre
3. Non-performing centres	:	Pampadumpara; no representative attended the Workshop.
4. Brief description of work done and salient results reported	:	

The Chairman in his introductory remarks expressed concern for giving relatively less importance to the Entomology discipline in the Coordinated Project for Spices. Out of the 41 scientists in the Project, only 2 are from Entomology even though important problems like thrips on cardamom,, leaf eating caterpillar on coriander and the rhizome maggots of turmeric are yet to be tackled. He appealed to the Scientists to highlight the entomological problems of the different crops and put up concrete proposals to the Coordinator. This was followed by the presentation of a review paper by Dr. T. Prem Kumar, NRCS, Calicut. The Chairman suggested to develop a comprehensive chemical control schedule for all the major pests of black pepper. This was followed by the presentation of work carried out at Mudigere centre by Dr. Chakravarty. In the absence of Entomolgist from Pampadumpara centre, the work could not be presented and the report from the station revealed that it was not strictly according to the technical programme. This was followed by the presentation of the findings of the Entomology Section of Spices Board by Dr. S. Varadarasan. In the absence of Plant Physiologists and

Biochemists, Dr. Chandrappa the Plant Breeder from Mudigere centre presented the findings in Plant Physiology. At the end, Dr. A. Ramadasan, Joint Director, NRCS, Calicut reviewed the work on Plant Physiology and Biochemistry.

A brief description of work carried out and the salient results are presented below :

1. Screening of cardamom varieties for drought tolerance was conducted at RARS, Mudigere. In the summer months (Jan. to June) growth parameters viz. number of tillers, leaf number, middle leaf dry weight and leaf area for the 12 clones were studied to understand their behaviour, when they are not given irrigation. The results indicated that among 12 clones studied, clone P6 and Clone 757 were found to be relatively more drought tolerant than others. Data on dry matter accumulation and leaf area index for 3 seasons were presented.

2. The project on drought tolerance be strengthened at Mudigere. Besides the total dry matter production and leaf area expansion under stress in relation to depleting soil moisture should be collected.

3. The promising lines should be further evaluated under field conditions in Mudigere and Yercaud. The Physiologist of Mudigere may take the help of NRCS in conducting further work.

4. Results of experiment on the effect of light intensity of on sucker production were presented. Both the number of suckers produced and the plant height were more when light intensity was little.

5. The study on the effect of growth regulators on the production of suckers has not yielded any significant result. It is suggested that the Physiologist of Mudigere may take the help of NRCS for the modification of technical programme and in re-laying the experiment.

6. Quality Evaluation studies : The VIII Workshop has recommended to take up quality studies of all the spices at NRCS. The ginger germplasm available in other centres may be sent to NRCS to evaluate the quality parameters. The Project Coordinator (Spices), The Director of Spices Development, Calicut, Joint Director and Biochemist of NRCS should meet and decide the format or proforma for collection and despatch of samples. They may also decide on the quality parameters to be analysed.

When quality evaluation in ginger is carried out at centres other than NRCS, the concerned biochemists of the different centres should discuss and decide a common approach on method, sampling procedure etc.

5. Recommendations ready for transfer to extension agency : Nil

6. Programmes proposed for the next year

The present projects may be continued with modification. In pursuance to the decisions made during the Guntur Workshop, 1987 for the "Studies on the control measures against cardamom thrips and capsule borer"; new trials for evaluation of the efficacy of different insecticides against cardamom pests with 12 treatments has been laid out with 12 treatments as listed below :

1.	Ekalux	25% EC
2.	Anthio	25% EC
3.	Metacid	50% EC
4.	Dimecron	100% EC
5.	Malathion	50% EC
6.	Monocrotophos	36% EC
7.	Furadan	3% G
8.	Endosulphan	35% EC
9.	Rugby	10% G
10.	Dimilin	25% WP
11.	Chlorpyriphos	20% EC
12.	Asataph	75% WSP

The Project Coordinator has been requested to give necessary instructions for carrying out this new experiment.

SPECIAL TECHNICAL SESSION VII : MINUTES OF THE GROUP MEETING ON THE VARIETY RELEASE

Chairman : Dr. K.G. Shanmugavelu

MINUTES OF THE GROUP MEETING ON VARIETY RELEASE

Chairman : Dr. K.G. Shanmugavelu, (Dean, Horticulture)

Members :
1. Dr. M. Rama Rao (Guntur, APAU)
2. Dr. K.G, Mehta (Jagudan, GAU)
3. Dr. V. Sukumara Pillay (Panniyur, KAU)
4. Dr. R.S. Rattan (Solan, YSPUHF)
5. Dr. R.K. Sharma (Jobner, RAU)
6. Dr. D.C. Mohanty (Pottangi, OUAT)
7. Shri Peter G.B. Vedamuthu (Coimbatore, TNAU)
8. Dr. S. Edison (PC, Spices)

The Committee scrutinized the variety release proposals received from various centres and the following recommendations are made.

TURMERIC

1. PTS 24 : (Pottangi)

The proposal for release of PTS 24 was examined and it was found that the yield is on par with the already released variety 'Roma' (PTS 10). The curcumin content is also less than the cultivar. It is claimed that PTS 24 has better seed storage quality for which data are lacking. However, it is also learnt that the Orissa state has already released the culture as 'Surama'. A copy of the variety release of 'Surama' may be sent to the Project Coordinator (Spices) by Dr. D.C. Mohanty, Breeder (Pottangi).

2. 21A and 15B (KAU)

The cultures 21A and 15B which are reported to be promising than Wynad local may be tested under MLT and ART on larger plot size. Adequate seed materials may be built up before coming for release.

GINGER (Solan)

1. SG 666

The Culture SG 666 which is reported to be promising than the local check should be tested in a larger plot sizes under MLT and ART. Adequate seed material may be built up before communicating for release.

FENUGREEK (Jobner)

1. NL (M) Proposed as RMT-1 (PRABHA)

The committee recommended that the culture NL (M) may be released for the state of Rajasthan provided the scientists of the centre could furnish the statistical analysis of Tables 2 and 3. This culture was found to yield better than the local check and also found to be moderately resistant to powdery mildew and root rot.

CORIANDER (Jobner)

1. UD 20

The data should be furnished for irrigated and rainfed conditions separately and they should be statistically analysed. This culture is reported to be moderately resistant to stem gall which needs to be substantiated. In table 2 the yield was lower than the local checks in six locations and the reasons for such low yield may be furnished and then this may be sent for release.

General guidelines :

1. A minimum number of (10) MLT and ART tests should be conducted before release proposals are sent.

2. The centre proposing variety release should possess adequate quantity of breeder's seed meterial. This needs to be specified for each crop.

3. Multiple copies of proposals (30 copies) may be sent to the Committee along with one page note on the salient features about the variety.

4. The Scientists may present their varieties with visual aids and live specimens before the committee.

5. The proposal should always accompany with recommended package of practices.

6. All the data should be statistically analysed and resistance to pests and diseases reported should be evaluated both under field and controlled conditions.

7. Regarding the release of perennial crops proposals may be sent along with 5 years yield data after stabilization of yield. In this case no ART and MLT are necessary.

8. As a miscellaneous matter, the group also endorsed the need for forming a small committee to discuss exchange/ import of germplasm of minor spices.

--oOo--

PLENARY SESSION

CHAIRMAN : Dr. K.L. Chadha

RAPPORTEUR : Dr. S. Edison

PLENARY SESSION

The Plenary session section was chaired by Dr. K.L. Chadha, Dy.Director General (Hort), ICAR. Dr. Chadha in his opening remarks highlighted the importance of the All India Coordinated Research Project on Spices and the fruitful deliberations conducted at Solan for the preceding two days. He complimented the members of the Working Group II on Spices Research as well as the delegates attending the IX Workshop on Spices for having contributed effectively in discussing the draft document on Spices Research due to be presented to the National Committee on Spices. He also emphasised the need for provision of adequate research infrastructure and transfer of technology programmes, quantify elements to be supported in research, find additional financial resources, indicated collaborative activities with other Institutes including training in other countries; he also advised to be cautious while locating new sresearch centres in the light of the poor performance of some of the existing centres.

Dr. Chadha made a mention about production and distribution of adequate quantities of elite planting material. He desired a close collaboration between the Departments of Agriculture and Horticulture, Directorate of Cocoa, Arecanut and Spices Development, Directorate of Extension Education of the State Agricultural Universities, Krishi Vigyan Kendra etc. for effective transfer of technologies. Dr. Chadha emphasised the need to produce educational films and video cassettes to popularise the proven technologies.

The deliberations of the Solan Workshop also provided additional information in formulation of the VIII Plan including consideration for opening new coordinating centres in Bihar etc. The DDG mentioned that the requests for voluntary centres is increasing and requested the concerned agencies to adhere to the conditions prescribed by the ICAR in this regard.

The relevant Proceedings of the different Technical sessions reviewed the status of progress in the various experiments and were presented by the Sessional Chairmen; the future course of actions were also indicated. The salient recommendations made by the Workshop are listed below :

i) Out of the six proposals received for variety release, only one variety in fenugreek viz. NL (M) has been recommended for release. This variety proposed by the Jobner centre, is capable of yielding up to 60 Q1/ha and has moderate resistance to root rot and powdery mildew diseases in Rajasthan.

ii) Promising lines under advanced stages of assessment are : Cultures 239, 141, 331 in Pepper, Cultures PCT 13, PCT 14, Clones 15B and 21A in turmeric, Cultures C.S.287, C.S.2, C.S.4, C.S.6, C.S.694 and UD-374 in Coriander, Culture UC 198 in Cumin and Methi-3 in Fenugreek.

iii) The Workshop suggested a cautious approach while experimenting with organo mercurial fungicides besides newer chemcials like Metalaxyl, Al-Fosetyl in view of the break down of resistance and other ecological aspects.

The general decisions have been incorporated in the concerned technical sessions.

A N N E X U R E S

Annexure I

LIST OF RESEARCH CENTRES

Coordinating Cell :

National Research Centre for Spices
Marikunnu P.O.
Calicut 673012
Kerala.

Participating Centres :

Cardamom

1. Regional Research Station
(University of Agricultural Sciences)
Mudigere- 577 132
Karnataka.

2. Cardamom Research Station
(Kerala Agricultural University)
Pampadumpara - 685 553
Kerala.

3. Horticultural Research Station
(Tamil Nadu Agricultural University)
Yercaud - 636 602
Tamil Nadu.

Large Cardamom

4. ICAR Research Complex for NEH Region
Sikkim Centre
Gangtok - 737 102
Sikkim.

Pepper

5. Pepper Research Station
(Kerala Agricultural University)
Panniyur - 670 141
Kerala.

6. Pepper Research Station
(Andhra Pradesh Agricultural University)
Chintapalli - 531 111
Andhra Pradesh.

7. Pepper Research Station
(University of Agricultural Sciences)
Sirsi - 581 401
Karnataka.

Ginger and Turmeric

8. Department of Vegetable Crops
(Dr. Y.S. Parmer University of Horticulture & Forestry)
Solan - 173 230
Himachal Pradesh.

9. High Altitude Research Station
(Orissa University of Agriculture & Technology)
Pottangi - 764 039
Orissa.

10. College of Horticulture
(Kerala Agricultural University)
Vellanikkara - 680 651.
Kerala.

11. Regional Agricultural Research Station
(Andhra Pradesh Agricultural University)
Jagtial - 505 327
Andhra Pradesh.

Condiments

12. Department of Genetics & Plant Breeding
SKN College of Agriculture
Rajasthan Agricultural University
Jobner - 303 329
Rajasthan.

13. Regional Agricultural Research Station
(Gujarat Agricultural University)
Jagudan - 382 710
Gujarat.

14. Department of Spices & Plantation Crops
Faculity of Horticulture
(Tamil Nadu Agricultural University)
Coimbatore - 641 003
Tamil Nadu.

15. Regional Agricultural Research Station
(Andhra Pradesh Agricultural University)
Lam Farm
Guntur - 522 034
Andhra Pradesh.

Annexure II

TECHNICAL PROGRAMME APPROVED BY THE PROJECT IMPLEMENTATION COMMITTEE OF THE ICAR FOR THE VII PLAN UNDER THE ALL INDIA COORDINATED RESEARCH PROJECT ON SPICES

S.No.	Programmes/Sub Project	Centres
	CARDAMOM	
1.	Germplasm collection, description of types and varieties and their evaluation	Mudigere Pampadumpara & Yercaud
2.	Comparative yield trial of promising types	Mudigere Pampadumpara & Yercaud
3.	Hybridisation and selection	Mudigere & Pampadumpara
4.	Manurial experiments	Mudigere, Pampadumpara & Yercaud
5.	Micronutrient requirements of cardamom	Mudigere Pampadumpara & Yercaud
6.	Evolving control measures against Azhukal disease	Mudigere & Pampadumpara
7.	Evolving katte tolerant varieties & control measures against katte disease	Mudigere & Pampadumpara
8.	Evolving drought tolerant cardamom varieties	Mudigere
9.	Control measures against cardamom thrips and capsule borer	Mudigere & Pampadumpara

S.No.	Programmes/Sub Project	Centres
	LARGE CARDAMOM	
10.	Germplasm collection, description & evaluation	Gangtok
11.	Identifying tolerant types to two virus diseases of large cardamom and evolving control measures	Gangtok
12.	Comparative yield trial of high yielding clones identified	Gangtok
	PEPPER	
13.	Germplasm collection, description & evaluation	Panniyur Chintapalli & Sirsi
14.	Intervarietal hybridisation to evolve high yielding varieties	Panniyur
15.	Comparative yield trial of selected cultivars	Panniyur Chintapalli & Sirsi
16.	NPK fertiliser trial	Panniyur
17.	Investigation on quick wilt and slow wilt disease of pepper, including field testing of systemic fungicides	Panniyur Chintapalli & Sirsi
18.	Control of pollu disease	Panniyur
	GINGER	
19.	Germplasm collection & evaluation	Solan Pottangi & Vellanikkara
20.	Manurial trials	Pottangi & Vellanikkara
21.	Effect of mulching & intercropping	Pottangi & Vellanikkara

S.No.	Programmes/Sub Project	Centres
22.	Evolving control measures against soft rot disease	Vellanikkara Solan
23.	Quality evaluation in ginger	Solan
PLANTING		
24.	Germplasm collection and evaluation	Solan Pottangi Vellanikkara Coimbatore & Jagtial
25.	Multilocation trial in turmeric	Solan, Pottangi, Coimbatore & Jagtial
SEED SPICES CORIANDER		
26.	Germplasm collection, maintenance and evaluation	Coimbatore, Guntur, Jobner & Jagudan
27.	Mutation breeding to evolve varieties with earliness and resistance to disease	Coimbatore & Jobner
28.	Comparative yield trial in coriander	Coimbatore, Guntur, Jobner & Jagudan
29.	Response of Coriander to fertilizers	Jobner & Guntur
30.	Effect of leaf cutting on growth and yield of coriander varieties	Jobner & Guntur
31.	Quality evaluation of coriander accessions	Jobner

S.No.	Programme/Sub Project	Centres
	CUMIN	
32.	Germplasm collection, maintenance & evaluation	Jobner & Jagudan
33.	Multilocation varietal trial	Jobner & Jagudan
34.	Multiple cropping trial in cumin	Jagudan
35.	Evolving control measures against wilt disease	Jagudan
	FENNEL	
36.	Germplasm collection, maintenance & evaluation	Jobner & Jagudan
37.	Multilocation varietal trial	Jobner & Jagudan
	FENUGREEK	
38.	Germplasm collection, maintence & evaluation	Coimbatore Jobner, Jagudan & Guntur
39.	Evolving varieties resistant to powdery mildew through mutation breeding	Jobner, Jagudan& Coimbatore
40.	Comparative yield trial in fenugreek	Coimbatore, Jobner & Guntur
41.	Effect of time of sowing and spacing on yield in fenugreek	Coimbatore, Jobner & Guntur
42.	Effect of leaf cutting on growth and yield of fenugreek	Jobner & Jagudan

Annexure III

ALL INDIA COORDINATED RESEARCH PROJECT ON SPICES

VII PLAN Outlay (Year-wise)

(Rupees in lakhs)

S.No.	Name of the centre	1985-86	1986-87	1987-88	1988-89	1989-90	Total
1.	Pampadumpara	0.88	2.33	2.45	2.51	2.57	10.74
2.	Mudigere	1.21	2.61	2.64	2.78	2.85	12.09
3.	Yercaud	0.87	1.07	0.98	0.99	1.04	4.95
4.	Panniyur	1.17	2.41	2.58	2.39	2.49	11.04
5.	Chintapalli	0.60	1.53	1.42	1.18	1.24	5.97
6.	Sirsi	0.79	1.13	1.08	1.11	1.15	5.26
7.	Solan	0.89	1.44	1.46	1.47	1.53	6.79
8.	Pottangi	0.60	1.42	1.38	1.40	1.44	6.24
9.	Vellanikkara	0.78	1.01	0.99	1.00	1.05	4.83
10.	Jobner	1.35	3.15	2.91	2.69	2.77	12.87
11.	Guntur	0.68	1.63	1.52	1.53	1.57	6.93
12.	Jagudan	0.60	1.28	1.14	1.15	1.20	5.37
13.	Coimbatore	0.60	1.38	1.14	1.15	1.19	5.46
14.	Jagtial	Nil	0.83	0.62	0.62	0.66	2.73
	Total	11.02	23.22	22.31	21.97	22.75	101.27
	ICAR share	8.26	17.42	16.73	16.47	17.06	75.94
15.	Gangtok Centre (100%)	Nil	1.04	0.90	0.81	0.84	3.59
	Total ICAR share	8.26	18.46	17.63	17.28	17.90	79.53

ALL INDIA COORDINATED RESEARCH PROJECT ON SPICES

VII PLAN outlay (Sub-head wise outlay 1985-90)

(Rupees in lakhs)

Sl.No.	Name of the Centre	Salary	T.A.	Recurring	Non-Recurring	Total	ICAR Share
1.	Pampadumpara	8.27	0.28	2.19	-	10.74	8.06
2.	Mudigere	8.75	0.29	2.90	0.15	12.00	9.08
3.	Yercaud	3.25	0.29	1.28	0.13	4.95	3.70
4.	Panniyur	7.90	0.37	2.27	0.50	11.04	8.27
5.	Chintapalli	3.95	0.24	1.12	0.66	5.97	4.48
6.	Sirsi	3.77	0.22	1.12	0.15	5.26	3.95
7.	Solan	4.75	0.33	1.68	0.03	6.79	5.10
8.	Pottangi	4.78	0.24	1.12	0.10	6.24	4.67
9.	Vellanikkara	3.32	0.24	1.20	0.07	4.83	3.63
10.	Jobner	8.75	0.37	2.88	0.87	12.87	9.64
11.	Lam, Guntur	4.84	0.24	1.68	0.17	6.93	5.20
12.	Jagudan	3.81	0.24	1.12	0.20	5.37	4.03
13.	Coimbatore	3.80	0.24	1.12	0.30	5.46	4.10
14.	Jagtial	1.80	0.20	0.48	0.25	2.73	2.05
	Total	71.74	3.79	22.16	3.58	101.27	75.94
	ICAR share (75%)	53.80	2.84	16.62	2.68	75.94	
15.	Gangtok (100% ICAR)	1.94	0.24	0.96	0.45	3.59	3.59
	GRAND TOTAL ICAR	55.74	3.08	17.58	3.13	79.53	79.53

Expenditure in centres for 1985-86, 1986-87 & 1987-88

(Rupees in lakhs)

S. No.	Name of the Centre	1985-86		1986-87		1987-88	
		Allo-cation	Exp.	Allo-cation	Exp.	Allo-cation	Exp.
1.	Pampadumpara	0.83	1.46	2.33	1.91	2.45	2.30
2.	Mudigere	1.21	2.00	2.61	2.58	2.64	3.16
3.	Yercaud	0.87	1.11	1.07	1.03	0.98	0.84
4.	Panniyur	1.17	2.17	2.41	2.51	2.58	2.73
5.	Chintapalli	0.60	0.75	1.53	1.08	1.42	1.05
6.	Sirsi	0.79	0.30	1.13	0.92	1.08	1.09
7.	Solan	0.89	0.97	1.44	1.40	1.46	1.91
8.	Pottangi	0.60	0.88	1.42	1.25	1.38	1.36
9.	Vellanikkara	0.78	0.93	1.01	0.84	0.99	1.16
10.	Jobner	1.33	2.40	3.15	3.48	2.91	3.85
11.	Guntur	0.68	1.30	1.63	1.55	1.52	1.52
12.	Jagudan	0.60	0.56	1.28	0.71	1.14	0.88
13.	Coimbatore	0.60	0.81	1.38	0.82	1.14	0.87
14.	Jagtial	-	-	0.83	0.19	0.62	0.74
15.	Gangtok	-	-	1.14	0.45	0.90	1.19

Annexure IV

LIST OF PARTICIPANTS

A. Chief Guest

Shri SANT RAMJI, Hon'ble Minister for Agriculture
Himachal Pradesh.

B. Indian Council of Agricultural Research, Krishi Bhawan, New Delhi - 110 001.

2. Dr. K.L. Chadha
Deputy Director General (Hort.)

3. Dr. Ramphal
Asst. Director General (Hort.)

4. Dr. S. Nagarajan
Asst. Director General (PP)

5. Sri. T.A. Sriram
Sr. Technical Officer

C. Special Invitees

6. Dr. K.G. Shanmugavelu
Dean, Faculty of Horticulture
TNAU, Coimbatore 641003

7. Dr. H.S. Sohi, Director
National Research Centre for Mushroom
Research and Training
Champaghat, Solan (H.P.)

8. Dr. K. Venkatasubha Reddy
Assoc. Director of Research
RARS, Chintapalli - 531 111
Visakha Dist. (A.P.)

9. Dr. M. Rama Rao
Assoc. Director of Research
RARS
Guntur - 522 034 (A.P.)

10. Dr. K.G. Mehta
Research Scientist
Spices Research Station
Jagudan - 382 710
Mehsana Dist. (Gujarat)

11. Prof. V. Sukumara Pillay
Prof. & Head, Pepper Research Station
Panniyur - 670141
Cannanore Dist. (Kerala)

12. Dr. D.N. Srivastava
Retd. Deputy Director General (Crop Sciences)
ICAR, New Delhi.

D. Project Coordinators

13. Dr. S. Edison
Project Coordinator (Spices)
NRCS, Calicut - 673012 (Kerala)

14. Dr. H.S. Gill
Project Coordinator (Vegetables)
Indian Agricultural Research Institute
New Delhi - 110 012.

E. Government of India

15. Sri. E. Velappan
Director
Directorate of Cocoa, Arecanut & Spices
Calicut - 673 005,
Kerala.

16. Sri. Paramjit Singh (Ministry of Agric.)
Asst. Commissioner
Dept. of Agric. & Corporation
New Delhi.

F. Government of Himachal Pradesh

17. Dr. Charanjit Singh
Director of Agriculture
Simla 171 005 (H.P.)

18. H.S. Dua (Veg.)
Subject Matter Specialist
Dept. of Agriculture
Himachal Pradesh.

G. Spices Board

19. Dr. R. Naidu
Director (Research)
Indian Cardamom Research Institute
Kailasanadu
Myladumpara 685 553
Idukki Dist. (Kerala)

20. Dr. Thomas Joseph
Plant Pathologist
ICRI, Myladumpara - 685 553
Idukki Dist. (Kerala)

21. Dr. M.R. Sudarsanam
Crop Botanist
Indian Cardamom Research Institute
Saklespur
Hassan Dist. Karnataka.

22. Dr. C.R. Sivadasan
Soil Scientist
ICRI, Myladumpara - 685 553
Idukki (Kerala)

23. Dr. S. Varadarsan
Entomologist
ICRI, Thadiyankudissai
Anna District, Tamilnadu.

24. Dr. A.K. Biswas.
Crop Botanist
ICRI, Pangthang
Gangtok, Sikkim.

25. Sri. T:D. John
Dy. Director, Spices Board
Cochin - 682018.

H. NRCS, Calicut - 673012

26. Dr. A. Ramadasan
Joint Director

27. Dr. Y.R. Sarma
Scientist S-3 (Plant pathology)

28. Dr. A.K. Sadanandan
Scientist S-2 (Soil Science)

29. Dr. T. Prem Kumar
Scientist S-2 (Entomology)

30. Dr. M.N. Venugopal
Scientist S-1 (Pl. pathology)

I. Host University
Dr. Y.S. Parmar University of Horticulture & Forestry, Solan - 173213.

31. Dr. M.R. Thakur
Vice Chancellor
Dr. Y.S. Parmar University
Solan - 173 213.

32. Dr. T.R. Chadha
Director of Research.

33. Dr. G.S. Dogra
Dean, College of Horticulture

34. Dr. P.P. Sharma
Prof. & Head. Dept. of Vegetable Crops.

35. Dr. P.K. Khosla
Director of Extension Education

36. Dr. M.P. Gupta
Dean, College of Forestry.

37. Shri B.S. Nanita
Registrar, Dr. Y.S. PUHF.

38. Dr. O.P. Sharma
Asstt. Scientist (Veg)

39. Dr. S.K. Sharma
Veg.. Seed Production Officer.

40. Dr. B.S. Metha
Asstt. Prof. (Veg).

41. Dr. Rajesh Soni
Asst. Professor (Floriculture)

42. Dr. G.S. Sandhu
Asstt. Prof. (Flori)

43. Dr. M.C. Thakur
Asst. Prof. (Veg).

44. Dr. A.K. Singh
Extension Specialist (Veg).

45. Dr. B.N. Korla
Veg. Breeder.

46. Dr. K.B. Rastogi
Veg. Breeder.

47. Dr. K.K. Singh
Assoc. Prof. (Veg.)

48. Dr. S.N. Peshin
Asstt. Prof. (Veg.)

49. Dr. O.P. Seghal
Head, Deptt. of Floriculture.

50. Dr. N.P. Dohroo
Jr. Plant Pathologist.

51. Shri Jai Ram
Directorate of Extn. Edn.

J. Scientists from Coordinating Centres

1. Pepper Research Station (Kerala Agricultural University) Panniyur, Taliparamba - 670 114 Cannanoor Dist. (Kerala)

52. Shri K.P. Mammootty
Asst. Prof.

2. Department of Plantation Crops & Spices, College of Horticulture (Kerala Agricultural University) Vellanikkara - 680 654. Kerala.

53. Smt. P.A. Valsala
Assoc. Prof.

3. Cardamom Research Station (Kerala Agricultural University) Pampadumpara - 685 553, Idukki, Kerala.

None participated.

4. Department of Spices & Plantation Crops, Faculty of Horticulture, (Tamil Nadu Agricultural University) Coimbatore - 641 003.

54. Mr. Peter G.B. Vedamuthu
Assoc. Prof.

55. Dr. V. Prakasam
Asstt. Prof.

5. Horticultural Research Station, Yercaud Salem - 636602, Tamil Nadu.

56. Shri M. Kader Mohideen
Assoc. Prof. (Hort.)

57. Shri M. Vijayakumar
Agronomist.

6. Regional Research Station
(University of Agriculture Science)
Mudigere 577 132, Karnataka.

58. Dr. H.M. Chandrappa
Breeder.

59. Dr. A.K. Chakravarthy
Jr. Entomologist.

7. Agricultural Research Station
(University of Agricultural Sciences)
Sirsi - 591 401, Karnataka.

60. Shri N.S. Malebennur
Jr. Pathologist

61. Shri Hemant G. Hedge
Jr. Horticulturist.

8. Regional Agricultural Research Station
(A.P. Agricultural University)
Guntur - 522 034, Andhra Pradesh.

62. Shri T. Srirama Rao
Horticulturist.

63. Shri P. Venkata Reddy
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9. Regional Agricultural Research Station
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64. Dr. V. Chiranjeevi
Jr. Pl. pathologist.

10. Regional Agricultural Research Station
(A.P. Agricultural University)
Jagtial - 505 327, Andhra Pradesh.

65. Shri M. Lakshminarayana Reddy
Asst. Research Officer (Hort.)

66. Shri T.G. Nagaeshwar Rao
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(Pl. pathology).

11. Department of Vegetable Crops & Floriculture
Dr. Y.S. Parmar University of Horticulture &
Forestry. Solan 173 213,
Himachal Pradesh.

67. Dr. R.S. Rattan
Assoc, Prof.

68. Dr. N.P. Dohroo
Jr. Plant Pathologist.

12. High Attitude Research Station
(Orissa University of Agriculture &Technology)
Pottangi - 764039, Orissa.

69. Dr. D.C. Mohanty
Breeder.

13. Dept. of Genitics & Pl. Breeding
SKN College of Agriculture
Jobner - 303 329, Rajasthan.

70. Dr. R.K. Sharma
Sr. Breeder & Prof.

71. Shri D.S. Bhati
Jr. Agronomist

72. Shri M.P. Jain
Pathologist

73. Dr. S.L. Doshora
Breeder.

14. Spices Research Station
(Gujarat Agricultural University)
Jagudan - 382 710, Gujarat.

74. Dr. D.B. Patel
Sr. Pl. Pathologist.

75. Shri M.H. Patel
Jr. Breeder.

15. ICAR Research Complex for NEH Region
Gangtok - 737 102, Sikkim.

76. Dr. L.S. Srivastava
Scientist S-2 (Pl. Pathology)

77. Shri G.S. Karibasappa
Scientist S-1 (Hort.)

K. Press & All India Radio.

78. P.D. Bharduaj
P.R.O. Dr. YSPUHF

79. Mrs. Dara Sure, The Tribune

80. Mr. Mela Ram, APRO, Solan

81. Representative of AIR, Simla.

L. Haryana Agricultural University

82. Dr. K.K. Thakral
Deptt. of Vegetable Crops & Spices
Haryana Agricultural University
Hissar - 125 004, Haryana.

83. Dr. G.R. Singh
Deptt. of Vegetable Crops & Spices
Haryana Agricultural University
Hissar - 125 004, Haryana.

M. National Bank for Agriculture and Rural Development

84. Dr. V.S. Motilal
General Manager(Tech)
NABARD, Sterling Centre,
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Bombay 400 018.

85. Dr. K.A. Mishra
Manager, (Tech)
NABARD RO
Post Box No. 6505
Trivandrum - 695 033.

86. Dr. T.Vilas Chandran
Development Officer (Tech)
NABARD RO
2nd Floor, National Chambers
Ashram Road P.B.No. 8
Ahemedabad - 380009.

N. Horticultural Input Agencies

87. M/s. Pyrites Phosphates Chemicals Ltd.

88. M/s. Rhone Poulenc Agrochemicals Ltd.

89. M/s. National Fertilizers Ltd.

90. M/s. Hindustan Ciba Geigy Ltd.

91. M/s. Rallis India Ltd.

92. M/s. Krishna Bharti Fertilizer Corp. Ltd.

93. M/s. Pesticides India Ltd.

94. M/s. Indofil Agrochemicals Ltd.

95. M/s. Hindustan Insecticides Ltd.

D. Other participants from the host University.

96. Dr. S.N. Peshin
Asst. Professor.

97. Dr. P.K. Seth
Sr. Mycologist & Head

98. Dr. S.S. Bhardwaj
Asst. Scientist (Pl.Pathology)

99. Dr. S.C. Tiwari
Head, Deptt. of Economics

100. Dr. P.D. Bhardwaj
PRO, Extn. Edn.

101. Dr. S.K. Chopra
Head, Post Harvest Tech. Deptt.

102. Dr. N.P. Singh
Asst. Scientist (Veg.)

103. Dr. K.R. Shaym
Scientist (Pl.Pathology)

104. Dr. O.P. Sharma,
Joint Director (Extn. Education)

105. Dr. N.K. Sharma
Assoc. Professor, Deptt. of Entomology

106. Dr. O.P. Bhalla
Prof. of Entomology

107. Dr. V.K. Mishra
Assoc. Professor (Silviculture)

108. Shri L.R. Sharma
Asstt. Scientist, Economics

109. Dr. B.B. Lal
Assoc. Professor, Post Harvest Tech. Deptt.

110. Dr. R.P. Awasthi
Prof. & Head, Deptt. of Fruit culture &
Nursery Management.